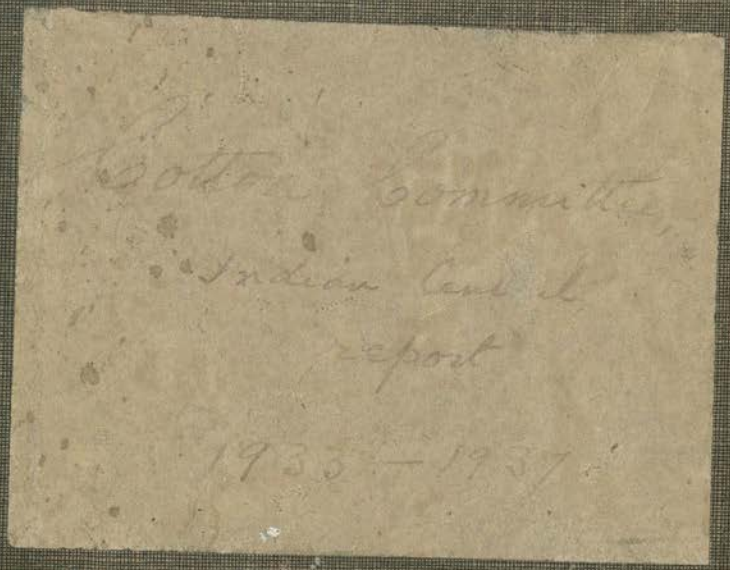

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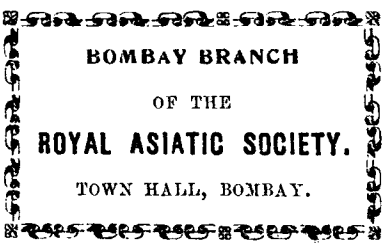

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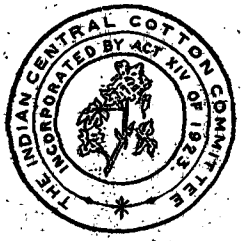

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FOR THE

YEAR ENDING 31st AUGUST 1933.-37

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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1933.

CHAPTER I.

THE Indian Central Cotton Committee was constituted by Resolution No. 404-22, dated the 31st March 1921, of the Government of India in the Department of Revenue and Agriculture and was the direct outcome of the Indian Cotton Committee whose report was published in 1919. Initially the Committee was purely an advisory body, but with the passing of the Cotton Cess Act in 1923 it was incorporated and provided with funds for the purpose of improving and developing the growing, marketing and manufacture of cotton in India. The Committee thus fulfils two main functions, viz., it advises the Government of India and Local Governments on matters concerning the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention and, secondly, it provides funds for research into cotton problems of an all-India importance or for large areas where cotton is an important crop. The research section of the Committee's work has now gone beyond the experimental stage, as will be seen in Chapters III and IV of this report.

In addition to the above, the Committee offers a common meeting ground for all branches of the cotton industry. All the main interests associated with cotton, viz., the grower, the ginner, the exporter, the mill-owner and the agricultural expert, are represented on the Committee, as will be seen below, and there is no branch of cotton industry in India which the Committee cannot deal with authoritatively. The Committee, however, pays greater attention to the interests of the cotton grower whose welfare has always been its chief concern.

PERSONNEL.

2. Under the Indian Cotton Cess Rules, members hold office for three years, and a third retire annually in rotation. The following were the members of the Committee on the 31st August 1933 :—

(1) PRESIDENT.—Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. S. V. Ramamurty, I.C.S., Director of Agriculture.
Bombay	The Director of Agriculture.
United Provinces ..	Mr. P. B. Richards, I.A.S., Entomologist to Government.
Punjab	Mr. H. R. Stewart, I.A.S., Director of Agriculture.
Central Provinces ..	Mr. F. J. Plymen, C.I.E., I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E. (*Vice-President*).
The Bombay Mill-owners' Association .	Mr. S. D. Saklatvala.
The Bombay Chamber of Commerce ..	Mr. H. B. Moore.
The Indian Merchants' Chamber	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. J. O. G. Barnes.
The Ahmedabad Mill-owners' Association..	Sheth Naranlal Jivanlal.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce	Mr. E. J. W. Plummer.
The Empire Cotton Growing Corporation	Mr. W. Roberts.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Mr. Y. G. Deshpande. Rao Bahadur G. R. Kothare.
Madras	Mr. Robert Lee.
Punjab	Khan Bahadur Sardar Habibullah, M.L.C.
Bengal	Mr. Nalini Ranjan Sarkar.

(7) CO-OPERATIVE BANKING REPRESENTATIVE—Rao Bahadur M. G. Deshpande, C.B.E.

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY.

Madras	The Hon'ble Mr. V. C. Vellingiri Gounder. M. R. Ry. K. Sarabha Reddi Garu.
Bombay	Sardar Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Bahadur Chenbasappa Shidramappa Shirahatti.
United Provinces ..	Khan Bahadur Maulvi Mohammad Obaidur Rahman Khan, M.L.C. Rao Bahadur Rao Bikram Sinha, M.L.C.
Punjab	Sardar Sampuran Singh, M.L.C. Mian Nurullah, M.L.C.
Central Provinces and Berar.	Mr. N. M. Deshmukh. Mr. J. B. Deshmukh.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. B. A. Collins, C.I.E., I.C.S., Director-General and Secretary to Government, Department of Commerce and Industry.
Baroda State	Mr. C. V. Sane, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Agricultural Adviser.
Rajputana and Central India States	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL IN COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Dr. W. Burns, I.A.S., Offg. Director of Agriculture, Bombay Presidency.
3. Dr. L. C. Coleman, C.I.E., Director of Agriculture, Mysore State.
4. M. R. Ry. V. Ramanatha Ayyar, Avl., Cotton Specialist, Coimbatore.
5. Mashir Bahadur S. V. Kanungo, Commissioner of Customs, Excise and Commerce, Holkar State, Representative of the Indore State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind.
7. Mr. Girdharlal B. Kotak, Representative of the Karachi Indian Merchants' Association, Karachi.
8. Rai Saheb Thakur Ram Prasad Singh, Economic Botanist to Government (for Cotton), United Provinces.
9. Khan Saheb Farrukhbeg Sadikalibeg Mirza, President, District Local Board, Nawabshah, Sind.
10. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.

Secretary.—Mr. P. H. Rama Reddi, I.A.S.

Deputy Secretary.—Vacant.

Director, Technological Laboratory.—Dr. Nazir Ahmad.

Publicity Officer.—Mr. R. D. Mihra.

Mr. Mohammad Azhar Ali, an additional member appointed by the Governor-General in Council under Section 4 (*xi*) of the Indian Cotton Cess Act, retired with effect from the 1st April 1933, and his successor has not yet been appointed.

Sir Purshotamdas Thakurdas was elected Vice-President for the year 1933-34.

SUB-COMMITTEES.

3. *Standing Finance Sub-Committee.*—As required by the Rules under the Indian Cotton Cess Act, the following members were appointed to form the Standing Finance Sub-Committee :—

Sir Purshotamdas Thakurdas (*Vice-President*), *Chairman*, Dewan Bahadur Sir T. Vijayaraghavacharya, *President* (*ex-officio*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur G. R. Kothare, Mr. J. O. G. Barnes and Mr. Chunilal B. Mehta.

Sir Joseph Kay resigned his appointment on the Committee during the year and Mr. H. B. Moore, who succeeded him, was appointed in his place on the Sub-Committee with effect from the 9th August 1933.

The Sub-Committee met eight times during the year.

4. *Local Sub-Committee.*—This Sub-Committee consists of all members living in or near Bombay though any member of the Committee may attend its meetings. The constitution of the Sub-Committee was as follows :—

Dewan Bahadur Sir T. Vijayaraghavacharya (*President*), Sir Purshotamdas Thakurdas (*Vice-President*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Girdharlal B. Kotak, Mr. J. O. G. Barnes, Mr. Chunilal B. Mehta and Mr. C. V. Sane.

On the resignation of Sir Joseph Kay, his place on the Sub-Committee was taken by Mr. H. B. Moore, his successor on the Committee.

Mr. Girdharlal B. Kotak was temporarily out of India and during his absence his place on the Sub-Committee remained unfilled.

The Sub-Committee held seven meetings during the year.

5. *Cotton Ginning and Pressing Factories Sub-Committee.*—Like the Standing Finance Sub-Committee, this Sub-Committee is also a statutory body appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. It consisted of the following members :—

Sir Purshotamdas Thakurdas (*Vice-President*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Mr. J. O. G. Barnes, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. Robert Lee, Mr. W. Roberts, Mr. J. Tinker, Mr. Y. G. Deshpande, Rao Bahadur M. G. Deshpande and Lala Shri Ram (co-opted).

Sir Joseph Kay and Mr. Tinker resigned from the Committee in the course of the year and the question of the appointment of their successors on this Sub-Committee will be taken up at its next meeting.

The Sub-Committee did not meet during the year.

6. *Sub-Committee on Malpractices.*—This Sub-Committee was constituted as follows :—

Sir Purshotamdas Thakurdas (*Vice-President*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Mr. J. O. G. Barnes, Mr. Chunilal B. Mehta, Mr. J. Vonesch, Mr. T. F. Main and Sardar Rao Bahadur Bhimbhai Ranchodji Naik, with power to co-opt.

The question of filling the vacancy of Sir Joseph Kay who resigned and of Mr. Main who retired during the year will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee did not meet during the year.

7. *Agricultural Research Sub-Committee.*—This Sub-Committee assembles during the meetings of the full Committee, reports on the progress made on the schemes financed by the Committee, examines proposals for new research schemes or extensions of schemes in operation, and considers the reports of research students. The Sub-Committee was composed of the following members :—

The President, The Vice-President (Sir Purshotamdas Thakurdas), Mr. F. K. Jackson, Rao Bahadur M. G. Deshpande, Mr. W. Roberts, Sir Joseph A. Kay, Mr. F. J. Plymen, Mr. H. R. Stewart, Mr. V. Ramanatha Ayyar; Mr. B. C. Burt, Dr. L. C. Coleman, Dr. W. Burns, Mr. D. N. Mahta, Rai Saheb Thakur Ram Prasad Singh, Mr. H. H. Pandya, Mr. W. J. Jenkins, Mr. P. B. Richards, Mr. B. A. Collins, Mr. S. V. Ramamurty, Mr. C. V. Sane, and Mr. Chunilal B. Mehta (additional members); The Cotton Research Botanist, Lyallpur (co-opted member), and The Secretary.

Sir Joseph Kay resigned in the course of the year and his seat on the Sub-Committee remained unfilled.

Rai Saheb Kalidas Sawhney was co-opted as a member on the Sub-Committee at its January and August 1933 meetings and Prof. R. H. Dastur at its August meeting.

The Sub-Committee met twice during the year.

8. *Technological Research Sub-Committee.*—This Sub-Committee meets during the half-yearly meetings of the Indian Central Cotton Committee and deals with all matters connected with the Technological Laboratory and Technological Research. The Sub-Committee consisted of the following members :—

The President, Sir Purshotamdas Thakurdas (*Vice-President*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Mr. B. C. Burt, Mr. H. R. Stewart, Mr. T. F. Main, Mr. Chunilal B. Mehta, Mr. Y. G. Deshpande, Seth Naranlal Jivanlal, Mr. S. V. Ramamurty, Lala Shri Ram, Mr. J. Tinker and the following co-opted members :—

Sir Munmohandas Ramji .. } Representatives of the Bombay
Mr. F. Stones .. .. } Millowners' Association.
Seth Chamanlal G. Parekh . } Representatives of the Ahmeda-
Seth Kasturbhai Lalbhai .. } bad Millowners' Association.
Mr. R. G. Saraiya .. .. } Representatives of the East India
Mr. Jamnadas Ramdas .. } Cotton Association.

At the August 1933 meeting of the Sub-Committee, Messrs. H. B. Moore and E. J. W. Plummer and Dr. W. Burns were co-opted on the Sub-Committee in the places, respectively, of Sir Joseph Kay and Mr. J. Tinker who resigned and Mr. T. F. Main who retired during the year.

The Sub-Committee met thrice during the year under review. At one of its meetings, the only subject dealt with was the subject of the greater use of Indian cotton in the United Kingdom as a result of Article 8 of the Ottawa Agreement.

9. *Research Students Selection Sub-Committee.*—This Sub-Committee was composed of the following members :—

The President, Sir Purshotamdas Thakurdas (*Vice-President*), Sir Joseph A. Kay, Mr. S. D. Saklatvala, Mr. B. C. Burt, Dr. W. Burns, Mr. P. B. Richards, Mr. H. R. Stewart, Mr. F. J. Plymen, Mr. S. V. Ramamurty, Dr. L. C. Coleman, Mr. H. H. Pandya, Mr. T. F. Main, Mr. W. J. Jenkins, Mr. F. K. Jackson, Mr. C. V. Sane and Dr. Nazir Ahmad.

Sir Joseph Kay resigned and Mr. Main retired during the course of the year, and the question of filling these vacancies will be taken up when the Sub-Committee meets next.

The Sub-Committee met only once during the year.

10. *Forecast Improvement Sub-Committee.*—This Sub-Committee was appointed for the first time by the Committee at its meeting held in February 1933 to deal with the improvement of cotton forecasts. It consisted of the following members :—

The President, The Director-General of Commercial Intelligence and Statistics, The Director of Agriculture, Bombay; The Director of Agriculture, Punjab ; The Director of Agriculture, Madras ; The Director-General of Commerce and Industry, Hyderabad; The Director of Agriculture, Baroda ; The Director of Land Records, Central Provinces and Berar, and The Director of Agriculture, United Provinces.

The Sub-Committee met only once during the year.

11. *Special Sub-Committees.*—As required by the rules under the Indian Cotton Cess Act, a Special Sub-Committee met twice during the year to select candidates for the posts of Cotton Research Botanists in the Bombay Presidency and the Punjab.

The question of the merging of the Committee's grants in Provincial Revenues and the connected questions of the position of employees of Provincial Governments paid from its grants and the re-employment of ex-servants and ex-research students of the Committee formed the chief subject of discussion of a Special Sub-Committee which met twice during the year. At the second meeting recommendations were also made in regard to the pay of some of its research officers and allowances were proposed for the provincial officers in charge of the Committee's research schemes.

One more Special Sub-Committee was appointed by the Committee at its August 1933 meeting to consider the question of subsidy to the Hubli and Gadag Seed Distribution and Extension Schemes.

12. These several Sub-Committees have contributed very largely to the disposal of most of the detailed work of the Committee thereby saving, to a not inappreciable extent, the time of the full Committee at its half-yearly meetings. The members of the Sub-Committees, and especially the Bombay members, have given ungrudgingly of their time to the work of the Committee, and much of the success to which the Committee can lay claim must be attributed to their whole-hearted efforts.

(*a*) Sardar Rao Bahadur Bhimbhai Ranchodji Naik continued as the Committee's representative on the Imperial Council of Agricultural Research.

(*b*) Sardar Rao Bahadur Bhimbhai Ranchodji Naik and Mr. M. P. Kolhe who were nominated to the Board of the East India Cotton Association by the Committee from among its growers' representatives remained in office till March 31, 1933, when Mr. Kolhe ceased to be a member of the Committee. In response to the proposal of the Government of Bombay, the Committee agreed to increase its representation of cotton growers' interests on the

Board of the East India Cotton Association from two to three and appointed the following three members :—

Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. N. M. Deshmukh and Mian Nurullah.

The following gentlemen represent the Committee on the Joint Committee of the Imperial Council of Agricultural Research and the Committee in connection with the investigation into the cost of growing cotton, sugarcane and their rotation crops :—

Sir Purshotamdas Thakurdas, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Haridas Madhavdas (representative of the East India Cotton Association) and The Secretary.

As Sir Joseph Kay who was also a member of this Joint Committee resigned from the Committee, steps will be taken to appoint a successor in his place.

In response to an invitation from the International Federation of Master Cotton Spinners' and Manufacturers' Associations to send a representative to attend the International Cotton Congress at Prague in June 1933, the Committee appointed Mr. G. Boyagis, of Messrs. Langley & Co., who was on leave in England, to represent it.

MEETINGS.

13. The Indian Central Cotton Committee held two meetings during the year under review. At the special request of the Sind Cotton Committee the first meeting was held at Karachi on the 2nd and 3rd February 1933, in the Assembly Hall of the Karachi Chamber of Commerce, Karachi, and was attended by the following visitors :—

Mr. H. Dow, C.I.E., I.C.S. ..	Members of the Sind Cotton Committee.
Mukhi Gobindram Pritamdas .	
Rai Bahadur Tharumal Bilaram	
Mr. D. M. Bakshi	
Lala Niranjan Prasad (*Chairman*)	Representatives of the Karachi Joint Cotton Committee.
Mr. A. P. Darlow (*Vice-Chairman*)	
Seth Chellaram Shewaram ..	
Mr. Geo. Gut	
Seth Issardas Varandmal ..	
Seth Nechaldas Chhangomal ..	
Lala Ruplal Shankardas ..	
Mr. C. Voegeli	
Mr. T. B. Dalal (*Secretary*) ..	

Mr. T. M. Gurbaxni (*Secretary*)	Karachi Indian Merchants' Association.
Mr. L. S. Carbonell	Representative of the Karachi Chamber of Commerce.

The second meeting was held at Bombay on the 29th and 30th August 1933. The following attended as visitors :—

Mr. R. P. Jones, British Cotton Growing Association, Khanewal.

Mr. J. V. Joshi, Deputy Director of Statistics, Calcutta.

Professor R. H. Dastur, Royal Institute of Science, Bombay.

Mr. J. B. Hutchinson, Geneticist and Botanist, Institute of Plant Industry, Indore.

Mr. Nizam-ud-din Hyder, Director of Agriculture, H.E.H. the Nizam's Dominions, Hyderabad (Deccan).

Mr. B. S. Patel, I.A.S., Deputy Director of Agriculture, Gujerat.

Mr. S. S. Salimath, Deputy Director of Agriculture, Dharwar.

A list of the important resolutions passed at these two meetings will be found in *Appendix I.*

STAFF.

14. The services of Mr. J. H. Ritchie, the Secretary, who proceeded on leave in June 1932, were replaced at the disposal of the Central Provinces Government.

Mr. P. H. Rama Reddi, Deputy Secretary, who officiated as Secretary during Mr. Ritchie's absence on leave, was confirmed as Secretary with effect from the 26th December 1932.

The post of Deputy Secretary remained vacant throughout the year under report.

Mr. R. D. Mihra, the Publicity and Propaganda Officer, on completion of his probationary period on the 31st May 1933, was confirmed in his appointment.

Dr. Nazir Ahmad held the post of Director, Technological Laboratory, during the year.

Mr. Mohammad Afzal continued to hold charge of the duties of the Cotton Research Botanist, Lyallpur, during the year.

I should like to record my appreciation of the loyal support and hearty co-operation which I received from every member of the office staff during the year.

PROVINCIAL COTTON COMMITTEES.

15. Provincial and Divisional Cotton Committees met as follows during the year :—

Punjab Provincial Cotton Committee	Twice.
Sind Cotton Committee	Twice.

The Karnatak and the Khandesh and Nasik Divisional Boards of Agriculture discussed matters concerning cotton at several of their meetings.

CHAPTER II.

FEATURES OF THE YEAR.

A. Season.

16. The year under report witnessed a further decline in the area of cotton in India. From 23,722,000 acres in the previous year, and 28,403,000 acres in 1925-26, the area fell to 22,558,000 acres in 1932-33. Though weather conditions at sowing time were not quite favourable, the condition of the crop throughout the season was on the whole fair, with the result that the final estimated yield stood at 4,516,000 bales of 400 lbs. as against the 4,025,000 bales of the preceding season. The average yield per acre recovered to 80 lbs. from the extremely low figure of 68 lbs. recorded for the previous season.

The returns of cotton pressed during the season 1932-33 show that 3,311,128 bales were pressed in British India and 1,351,639 bales in Indian States, making a total of 4,662,767 bales for the whole of India as compared with 3,309,180 bales pressed during 1931-32. The quantity of loose cotton received by the mills in 1932-33 in the major cotton-growing provinces in British India amounted to 215,279 bales of 400 lbs. as against 211,795 bales in the previous season. The crop of the season thus accounted for by the press returns and loose cotton received at the mills was 4,878,046 bales.

The prices of Indian cotton which were above parity with American cotton during the previous season declined relatively during the year under report with the result that imports of American cotton fell off considerably. Two other depressing influences on the market were first the uncertainty of Indian mill demand due to large imports of Japanese piecegoods, and later the threatened boycott of Indian cotton by Japan. The world's total consumption of Indian cotton, according to the International Federation Statistics, was only 4,200,000 bales during the year ending 31st July 1933 as compared with 4,788,000 bales during the previous year, and 6,087,000 bales in 1929-30. The quantity of Indian cotton consumed in India was, however, slightly more during the year under review than what it was during the previous season (vide *Appendix III*).

More gratifying is the fact that the consumption of Indian cotton in the rest of India excluding Bombay Island has, in the course of ten years, risen from 1,073,333 bales to 1,794,980 bales of 400 lbs., an increase of three-quarter million bales.

Exports of Indian cotton during the year under report rose to 2,741,000 bales of 400 lbs. from 1,582,000 bales of 400 lbs. in 1931-32. Though this figure is much below the record of 1924-25, viz., 3,998,000 bales, in view of the smaller crop of the year there is no reason to suppose that the off-take of Indian cotton during the season was below normal. The comparative figures of stocks of unsold cotton held in Bombay given in the table below, compiled from the East India Cotton Association's returns, also support this view :—

Descriptions.	31st August 1933.	31st August 1932.	31st August 1931.	31st August 1930.	31st August 1929.
Broach	94,570	63,043	38,577	31,012	15,053
Dholleras	79,484	49,300	57,559	37,354	40,291
Oomra	75,610	77,874	145,767	239,565	258,790
Khandesh	35,367	52,134	43,244	43 988	57,103
Bengals	31,337	46,272	38,800	28,276	63,121
Punjab-American	2,620	16,279	3,009	775	7,471
Dharwar	6,526	1,657	660	1,951	5,091
Comptas, Tinnevelleys and Cambodia	48,293	29,525	37,416	16,785	29,249
Westerns and Northerns ..	26,265	31,130	22,466	9,048	25,486
Persian	1,536	500	..	..	31
Americans	10,565	16,456	11,838	297	333
Egyptians	2,345	20,082	2,021	..	..
East Africans	13,405	21,975	32,645	12,293	13,592
Other sorts	14,007	4,836	10,879	10,628	26,363
Total ..	441,930	431,063	444,881	431,972	541,974

The total stocks of unsold Indian cotton at the end of the season during the last four years do not show much variation.

B. Work of the Year.

17. It is extremely gratifying to have the pleasure of reporting on another year of steady progress and further expansion in the activities of the Committee. As has been stated, the two main functions of the Committee are the financing of research into cotton problems and the tendering of expert advice on matters relating to cotton. The one is no less important than the other, as will be seen from the subsequent pages of this report. On the research side, eight new schemes costing in the aggregate about Rs. 2,85,496 were sanctioned by the Committee during the year under report, in addition to those already in operation. These schemes are dealt with in the subsequent chapters of this report. A review of the present position of legislative and other measures in the introduction of which the Committee has largely been instrumental and a brief resumé of the other activities of the Committee in its advisory capacity are given in the following paragraphs.

The review of the Committee's work and research policy, which was begun in 1930, concluded during the year under report. The policy hitherto followed by the Committee of avoiding any piece of research, which was of academic interest only, was confirmed, and it was emphasized that the principle of a definite economic end should be recognized while sanctioning new research schemes. As to the question of encouraging the cultivation of medium-staple ($\frac{7}{8}$" to 1") or long-staple (over 1") cottons as against short-staple cotton of below $\frac{7}{8}$", it was agreed that the objective of the Committee should be to develop each tract with reference to its natural advantages, the judicious exploitation of which alone would ensure the maximum return to the grower, whose welfare would and always must remain the chief concern of the Committee.

The proposed investigation into the cost of cultivation of cotton, sugarcane and their rotation crops in the principal cotton and sugarcane tracts of India, for which a special Joint Committee of the Imperial Council of Agricultural Research and this Committee was appointed, assumed definite shape and a detailed scheme involving a total expenditure of Rs. 5,12,000 and covering a period of about 3½ years was prepared by the Joint Committee and sanctioned by the Committee in February 1933. The entire cost of the research will be borne jointly by the Committee and the Imperial Council of Agricultural Research in equal proportion.

An important matter which engaged the attention of the Committee during the year was the question of implementing Article 8 of the Ottawa Trade Agreement, which reads as follows :—

> "His Majesty's Government in the United Kingdom undertake that they will co-operate in any practicable scheme that may be agreed between the manufacturing, trading and producing interests in the United Kingdom and India for promoting, whether by research, propaganda, or improved marketing, the greater use of Indian cotton in the United Kingdom."

It is a matter of considerable satisfaction to be able to record that the Committee decided at the very outset to collaborate with the Indian Cotton Enquiry Committee established in Manchester to tackle from the other end the problem of greater use of Indian cotton in the United Kingdom. As a result of the negotiations between the two Committees and the conversations between Sir Purshotamdas Thakurdas and Sir Richard H. Jackson (Chairman) and other members of the Indian Cotton Enquiry Committee, while the former was in England in June 1933, a perfect understanding of each other's points of view has resulted. It is hoped that the excellent relationship thus established between the two Committees will soon result in the devising of measures designed to lead to the greater use of Indian cotton in Lancashire. As a first step, experiments on Punjab-American 289-F, Surat 1027 A.L.F., Karunganni C. 7, Cambodia (Co. 2), Jayawant, Bengal and Oomras cottons were conducted in Lancashire, and yarn and cloth made from these cottons were shown to a specially convened meeting of merchants and shippers in Manchester. Further experiments with other short-staple cottons are

under way. This paragraph could not be better concluded than with the following considered opinion of the Indian Cotton Enquiry Committee :—

> "Finally, it is the opinion of the Committee that Lancashire can use more Indian cotton and that, with goodwill and co-operation, the consumption will increase. For its own part the Committee intends to do everything in its power to further the object for which it was established."

Mention should also be made here of the untiring efforts of Mr. H. A. F. Lindsay, C.I.E., C.B.E., the Indian Trade Commissioner in London, to promote the interests of Indian cotton in the United Kingdom.

The threatened boycott of Indian cotton by Japan was a matter which virtually galvanized the cotton industry of India during the latter part of the year under report. A Special Sub-Committee was forthwith appointed by the Committee to discuss, in general, the question of a wider market for Indian short-staple cotton, and to formulate, in particular, the views of the Committee on the more urgent question of the threatened boycott. The representation which the Committee secured on the panel of un-official advisers to the Indian Delegation and the course of subsequent events are matters for the next annual report.

THE COTTON TRANSPORT ACT.

18. At the request of the Indian Central Cotton Committee the Government of India, in 1923, passed the Cotton Transport Act which enables Local Governments to prohibit the import of cotton into any area within their jurisdiction. This Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior strains.

19. *BOMBAY.*—No change has taken place in the seven protected areas notified in the Bombay Presidency, and also in the policy to be followed in regard to the type of cotton to be extended in the Surat area. The information required to determine the cotton policy in Surat is now, however, nearly complete and a definite line of action is, therefore, likely to be taken in the near future.

20. There was no change during the year in the protected areas in Baroda, Rajpipla and Chhota-Udepur States.

21. *MADRAS.*—The object of the Act has not been fully realized by the absence of restriction on the movements of cotton by road and river. Cotton from the Cocanadas tract and the Nizam's Dominions enters the districts of Kurnool and Bellary, and Mysore and Malabar cottons find their way into Tiruppur.

Southerns Tract.—As the transport of cotton by road and river cannot be effectively checked without considerable expense, no legislative restrictions have been thought of at present. The amalgamation of the

Tiruppur and Tinnevelly areas, against which the Committee were strongly opposed, has also provided further facilities for mixing *Cambodia* with inferior cotton as the latter can be conveyed without restraint from one place to another within the protected area.

Northerns and Westerns Tract.—During the year the taluks of Markapur and Cumbum in the Kurnool district were excluded from the protected area. This change is likely to prove effective in preventing Cocanadas from entering the protected area by road as Chilama, the present eastern limit on the Guntakal-Bezwada line, is not easily accessible to bullock carts, being situated in the heart of the Nallamalai forest.

22. *CENTRAL PROVINCES.*—No change was made in the protected area in the Central Provinces and Berar.

23. *INDORE.*—There was no change in the protected area. As mentioned in last year's report, on the representation of the local mills the Indore Cotton Transport Act was amended and its scope restricted only to *Deshi-Mewadi* cotton instead of to all cotton as recommended by the Committee. Before, however, approaching the Indore Darbar for the re-imposition of the original restrictions, the Committee has decided to hold a conference at Bombay to which the representatives of the Indore mill industry will be invited as it was felt that a mutual exchange of views might provide a solution which would be acceptable to all the parties concerned.

24. *HYDERABAD.*—The areas protected under the Hyderabad State Cotton Cultivation and Transport Act remained unchanged during the year.

25. *SANGLI.*—The position of Sangli remained unaltered.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

26. During the year the Act worked smoothly and the few cases of infringements were reported to the authorities concerned. In all cases warning was given to the press owners concerned.

Arising out of a case of unmarked bales from the Central Provinces, the Chief Inspector of Factories of this province raised an important issue that, when the press mark and the serial number stencilled on the lashed side of a bale became indecipherable owing to the fading of the ink or the hessian being torn off, the factory owner could not be held responsible for the absence of the marks once the bales left the factory. The Committee's Solicitors, to whom this question was referred, were, however, of opinion that under Rule 7 (1) of the Cotton Ginning and Pressing Factories Rules, the owner of a factory was responsible for the marks being " clearly decipherable " and that it was for the press owner to take care to ensure that the ink which he used was of a quality which would not fade away and that the hessian

in which cotton was baled was also of such quality as would not tear off or rot before reaching the place at which the bales were to be tendered for delivery to the buyer to whom the correct and clear marking of the bales were intended as a guarantee that the bales tendered were actually pressed at a particular factory. The opinion of the Solicitors was communicated to the East India Cotton Association and to the authorities in the Central Provinces.

27. Legislation for the marking of bales and the submission of weekly press returns is now in force in the following States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Bikaner, Bundi, Cambay, Chhota-Udepur, Cutch, Datia, Dewas (Junior), Dhar, Dhrangadhra, Faridkot, Gondal, Gwalior, Holkar State (Indore), Hyderabad (The Nizam's Dominions), Idar, Jaipur, Jamkhandi, Jaora, Jasdan, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kishangarh, Kolhapur, Kotah, Lakhtar, Limbdi, Malerkotla, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Palitana, Patiala, Porbundar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayla, Shahpura, Tonk, Wadhwan, Wankaner and Western India States Agency areas.

All these States, with the exception of Gwalior and Palitana, supplied weekly returns for cotton pressed during the year.

LICENSING OF GINNING AND PRESSING FACTORIES.

28. When the question of the future work and policy of the Committee was discussed in December 1931, several members dwelt on the need for the introduction of the system of licensing gins and presses as the most effective method of putting a stop to certain malpractices which were so marked a feature of the cotton trade. The replies of the Trade Associations represented on the Committee who were consulted disclosed the absence of unanimity among them in favour of the measure. These replies together with a complete history of the case were considered by the Committee at its meeting in August 1933 when it was agreed, after a lengthy discussion, that the licensing of ginning and pressing factories was the only remedy for the various malpractices which were responsible for lowering the reputation of Indian cotton, and it was accordingly decided that the Government of India should be requested to amend the Cotton Ginning and Pressing Factories Act giving powers to Provincial Governments to introduce the licensing of gins and presses with the consent of their Legislative Councils.

MALPRACTICES.

29. The East India Cotton Association reported during the year four cases of bales having been rejected for containing watered cotton. Two lots came from Amraoti (Berar), one from Shegaon (Berar) and one from

Budhlada (Punjab). Certified copies of entries in the press registers were called for under Section 3 (3) of the Cotton Ginning and Pressing Factories Act and on receipt the information contained in them was communicated to the East India Cotton Association.

Two cases of false packing were reported—one from Jhang (Punjab) and the other from Sirhind in Patiala State. In the first case, which was reported by the Karachi Joint Cotton Committee, a certified copy of the entry in the press register was called for, and the information received was conveyed to the Karachi Joint Cotton Committee. Regarding the cotton from Sirhind, a report was made to the Patiala State authorities who warned the press concerned.

A general complaint regarding impurities in Sind and Bengals cottons was received from the Director, Bremer Baumwollborse, Bremen. He was asked to furnish the press marks and serial numbers on the bales reported to contain impurities, but no communication has so far been received from him. The Committee, however, took action by bringing the complaint to the notice of the Karachi Joint Cotton Committee in order that the attention of its members could be drawn to it. The Chief Agricultural Officer in Sind was also requested to bring the complaint to the notice of the Sind Cotton Committee and to issue necessary instructions to owners of ginning and pressing factories to avoid bad ginning.

COTTON MARKETS.

30. The proposal for the establishment of a cotton market at Amalner, to which reference was made in last year's report, received the approval of the Bombay Government. The District Local Board, Nasik, also resolved to establish a market at Malegaon, but owing to certain difficulties the resolution has not yet been given effect to.

The Bill for the establishment and better regulation of markets in the Madras Presidency, mentioned in last year's report, became law during the year. A copy of the Act will be found in *Appendix IV*.

Rules are being framed under the Central Provinces Cotton Market Act which was passed last year.

During the year the Karachi Cotton Association, Limited, came into existence, replacing the Karachi Joint Cotton Committee which had controlled and regulated the local cotton market from 1927.

It is gratifying to note that Indian States are not lagging behind the provinces in regard to the establishment of regulated markets for cotton. The Dhar State introduced Rules in 1929 for the regulation of cotton markets in the State and the Baroda Durbar has under consideration the report of a special committee dealing with the establishment of a regulated cotton market at Amreli. Sangli, one of the Southern Maratha Country States, has also introduced in the State Assembly a Bill for the establishment of cotton markets.

As stated in last year's report, commercial bodies and Agricultural Associations were asked for their views on the subject of the adoption of universal standards for Indian cottons. The replies received were considered by the Committee at its meeting held in February 1933 and it was resolved that steps should be taken to introduce universal standards for Indian cottons for use in India. A Standards Sub-Committee, consisting of five members, one representing the Imperial Council of Agricultural Research, two the East India Cotton Association and two the Karachi Cotton Association, has been appointed, to prepare, to begin with, standards for U. P. Bengals, Sind and Punjab-American cottons acceptable to both the Associations.

THE BOMBAY COTTON CONTRACTS ACT.

31. The Bombay Cotton Contracts Act, 1932, received the assent of the Governor-General in October 1932. A copy of the Act will be found in *Appendix V.*

PUBLICITY AND PROPAGANDA.

32. The Committee decided, in December 1931, to embark on a policy of publicity and propaganda and appointed, with effect from the 1st June 1932, a whole-time Publicity and Propaganda Officer whose report for the year under review will be seen in Chapter VI of this report. He participated in the Agricultural, Cattle and Village Improvement Show held at Pandharpur in November 1932 by organizing a stall for the exhibition of the standard Indian cottons and by delivering lectures and distributing illustrated folders on the objects and activities of the Committee. At the conclusion of the Show the Committee was awarded a Certificate of Merit. He also took part in the Industrial Exhibition held in April-May 1933 at Ujjain, by sending exhibits for display. He carried on propaganda in person in the Surat taluka in favour of the Clean-up scheme and gave wide publicity to the Committee's work by means of Press *communiqués*, leaflets and a coloured poster, some of which were favourably reviewed by the press in India and abroad.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

33. *The Mexican Boll-weevil* (*Anthonomus grandis*).—The restrictions on the import of American cotton into India imposed by the Government of India in 1925, at the instance of the Indian Central Cotton Committee, continued in force during the year under report, without change. American cotton can be imported into India only through the port of Bombay, and only after fumigation with hydrocyanic acid gas. During the year under review 65,446 bales of American cotton were fumigated at Bombay as against 244,695 bales during the previous year. The rebate of fumigation fees at the rate of 11 annas per square bale and 7 annas per round bale, recommended by the Committee on all American cotton fumigated during the year ending 31st March 1932, was sanctioned by the Government of India and paid to importers during the year under review.

The Committee's thanks are due to the Trustees of the Port of Bombay for effecting, as from the 1st September 1933, a substantial reduction in the cost of transportation and landing of American cotton under the new agreement subsisting between the Trustees and the Landing Contractors. The Committee has accordingly recommended to the Government of India to pass on to importers by way of a suitable reduction in fumigation fees the benefit of the present reduced cost of transportation and other charges.

34. *The Red (Sudan) Boll-worm (Diparopsis Castanea) and other pests.*—With a view to prevent the introduction into India of foreign cotton pests through unrestricted import of foreign cotton seed and *kapas* (unginned cotton), the Government of India have entirely prohibited the import of foreign *kapas* since 1925, and strictly regulated since 1931 the import of foreign cotton seed. Under these regulations foreign cotton seed can be imported only for experimental purposes by certain authorised officers in India, and that too, only through the port of Bombay, in quantities not exceeding 1 cwt. in any one consignment, which shall be examined at Bombay, and fumigated with carbon-bisulphide, if necessary. Under these regulations 22 parcels of cotton seed were received for examination and fumigation during the year under report as against six parcels in the previous year.

COTTON STATISTICS.

35. *Cotton forecasts.*—The arrangement introduced in 1930 under which the forecast figures are telegraphed by the Director-General of Commercial Intelligence and Statistics, Calcutta, to the Secretary, Indian Central Cotton Committee, for simultaneous publication at Bombay, continued to work satisfactorily. A further improvement in the arrangement effected in the year under report has successfully eliminated the possibility of delay in the release of the figures at Bombay, through delay in transmission or mutilation of messages. It is now possible to release the figures at Bombay correct to the very minute they are released at Calcutta. The cotton trade of Bombay would, no doubt, greatly appreciate these arrangements.

36. *Formation of a Cotton Forecast Improvement Sub-Committee.*—Reference was made in the last report to the Committee's earnest desire to help in the efforts made for the improvement of the accuracy of cotton forecasts compiled and published by Government and to the preparation of a memorandum on the subject by the Local Sub-Committee. As a result of the subsequent deliberations of the Committee, the Cotton Forecast Improvement Sub-Committee, referred to in paragraph 10 above, was formed to examine the accuracy of cotton forecasts and to make recommendations for improving the accuracy of future forecasts. This Sub-Committee met once during the year under report.

37. *Extra-factory or village or domestic consumption of cotton.*—The validity of the conventional figure of 750,000 bales of 400 lbs. taken to represent the quantity of raw cotton used annually in India for such domestic

purposes as hand-spinning and making quilts, mattresses, cordage, etc., has long been questioned, but no effort has so far been made to obtain a better or surer basis for estimating this figure. In view of the importance of this figure for checking the accuracy of cotton forecasts, the Committee decided that investigations should be made in selected villages in Madras, Bombay, Central Provinces, United Provinces, the Punjab, Sind, Bengal and Baroda to find out the amount of cotton that is used annually for domestic purposes. A sum of Rs. 22,500 has been sanctioned by the Committee to meet the expenditure on these investigations.

38. *Annual census of stocks of raw cotton.*—Variation in carry-over of cotton from season to season is as important a factor in the determination of the actual production of cotton of any season as the domestic consumption referred to in the foregoing paragraph. The greater the accuracy with which actual production of cotton during any season can be ascertained after the close of that season from known consumption in mills, exports, domestic consumption and variation in stocks, the greater are the chances of detection of the nature and extent of the errors in the forecast estimates made earlier in the season, and their rectification in future forecasts. Lack of complete information as to the stocks of raw cotton left in the country at the end of the season is therefore a real handicap. Hitherto such information was available only for the stocks carried by the trade and the mills in Bombay on the 31st August. At the request of the Committee, the Karachi Cotton Association, the Ahmedabad Millowners' Association, the Punjab Chamber of Commerce, the Northern India Chamber of Commerce and the Tuticorin Chamber of Commerce have now agreed to take a census of stocks held by the trade in their respective centres, viz., Karachi, Ahmedabad, Delhi, Lahore and Tuticorin. The question of taking similar action at Cawnpore, Madras, Pondicherry and Coimbatore is still under the consideration of the respective Chambers of Commerce. The Committee's thanks are due to these bodies for their valued co-operation in the matter. Statistics of stocks held by the mills in India are collected by the Committee direct. It is highly gratifying to note that the response from the mills to the Committee's request for information regarding stocks held on the 31st August 1933 has been exceptionally good and for this the Committee is indebted to the mills. A consolidated statement showing the total stocks held in India on the 31st August 1933 is given in *Appendix VI.*

39. *Raw Cotton Trade Statistics.*—It was reported last year that the Committee had recommended to the Government of India to arrange for separate trade statistics for loose cotton for all such trade blocks as, in the opinion of the Provincial authorities responsible for the compilation of cotton forecasts, were of importance for their purposes. The matter is still under the consideration of the Government of India.

40. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for mills of American cotton, the arrivals at Bombay, and the quantity at sea for India. Importers and millowners

of Bombay continued to furnish confidentially information regarding their purchases of American cotton, and the Committee once again wishes to record its thanks to them for their valued co-operation.

41. *Demand for various types of Indian cotton.*—Reference was made in last year's report to the efforts made to collect from mills and exporters information regarding the various types of Indian cotton received in mills and exported during the seasons 1928-29 to 1931-32. These figures were compiled and published during the year under report. Needless to say, these have been well received by those interested in one phase or other of the growing, marketing and manufacture of cotton in India. Encouraged by the results so far obtained, the Committee has decided to continue these enquiries in future. The Committee feels that it cannot too warmly express its appreciation to all those millowners and exporters who took the trouble of supplying the information asked for. Statements showing the results of the enquiries made in 1932 and 1933 are given in *Appendices VII and VIII.*

Before leaving off this subject it is, however, necessary just to refer to an important aspect of this enquiry, viz., its completeness, upon which depends its greater usefulness. There is nothing like an accurate and reliable set of statistics on these matters that can with advantage be used whenever required, to uphold the cause of the industry. The Committee would therefore be glad to see that returns are furnished to the Committee by every mill and exporter in India without exception.

42. *Cotton consumption.*—The compilation and publication of the monthly statements (*Appendix III*), (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States, (3) of loose cotton received in the mills in the major cotton-growing provinces and (4) a consolidated statement of (1) and (2) specially meant for publication in the daily Press, was continued.

COLLECTION AND SUPPLY OF INFORMATION.

43. As in the past, notes* on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee, were contributed to the Bombay Cotton Annual published by the East India Cotton Association.

PUBLICATIONS.

44. The Committee subscribes to a number of important scientific and technical journals and these are circulated to research workers and institutions of the Committee. This scheme of circulation, while effecting economy by preventing duplication of journals and periodicals purchased out of the Committee's funds, affords the workers in the mofussil an opportunity of perusing varied and up-to-date scientific literature, which otherwise would not be available for them.

* Appendix IX.

45. The name of the Committee is on the free mailing list of a number of private and public institutions, and to them the thanks of the Committee are due. Particular mention should be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to the Committee members. The Committee has also to record its thanks to the Indian Trade Commissioner, London; the United States Department of Agriculture, the Egyptian Ministry of Agriculture, Technical and Scientific Service, the Liverpool Cotton Association and the Imperial Bureau of Plant Genetics, Cambridge and other Associations and Chambers of Commerce which supply it with reports, statistics and other literature from time to time.

46. The following bulletins and reports were published during the year :—

(1) Technological Report on Banilla Cotton, 1930-32. (Technological Bulletin A-22.)

(2) Variation in the moisture content of baled Indian cotton with atmospheric Humidity. (Technological Bulletin A-23.)

(3) Technological Reports on Standard Indian Cottons, 1933. (Technological Bulletin A-24.)

(4) Examination of a proposed relationship between the lea-test and the single thread test results. (Technological Bulletin B-15.)

(5) Fibre Length Irregularity in Cotton. (Technological Bulletin B-16.)

(6) The Foundations of Yarn Strength and Yarn Extension, Part V. The prediction of the spinning value of a cotton from its fibre properties. (Technological Bulletin B-17.)

(7) Spinning Test Report on samples of A. R. Kampala, A. R. Busoga and A. R. Jinja Cottons, 1931-32. (Technological Circular No. 81.)

(8) Spinning Test Report on samples of Khandesh and Moglai cottons, 1931-32. (Technological Circular No. 85.)

(9) Spinning Test Reports on 1932-33 samples of :—

(*a*) Bengals and Ujjain Cottons. (Technological Circular No. 84.)

(*b*) Ujjain Cotton. (Technological Circular No. 88.)

(*c*) Broach Cotton. (Technological Circular No. 90.)

(*d*) Khandesh Cotton. (Technological Circular No. 91.)

(*e*) C. P. No. 1 and Berar Cottons. (Technological Circular No. 92.)

(*f*) Latur and Nanded Cottons. (Technological Circular No. 93.)

(*g*) Hubli Kumpta and Hubli Upland Cottons. (Technological Circular No. 95.)

(*h*) Surat, Tiruppur, Cambodia and African Busoga Cottons. (Technological Circular No. 96.)

(*i*) Bailhongal and Farm Westerns Cottons. (Technological Circular No. 97.)

(*j*) Jagadia Cotton. (Technological Circular No. 98.)

(*k*) Navsari Cotton. (Technological Circular No. 99.)

(*l*) Broach and Surat Cottons. (Technological Circular No. 100.)

(*m*) Navsari, Jagadia and Rajpipla Cottons. (Technological Circular No. 101.)

(*n*) Dholleras and Kadi-Viramgam Cottons. (Technological Circular No. 102.)

(*o*) Muttia and Kalagin Cottons. (Technological Circular No. 103.)

(10) Technological Reports on 1932-33 samples of :—

(*a*) Punjab-American. (Technological Circular No. 82.)

(*b*) Punjab-American 4F. (Technological Circular No. 89.)

(*c*) Verum 262 (Akola). (Technological Circular No. 83.)

(*d*) Umri Bani. (Technological Circular No. 86.)

(*e*) Umri Bani 262 (Nagpur). (Technological Circular No. 87.)

(*f*) Surat 1027 A.L.F. (Technological Circular No. 94.)

(11) Note on the Harmful Effects of adulterating good quality Indian Cottons. (Technological Leaflet No. 1.)

(12) Note on green-stained Sind-American Cotton. (Technological Leaflet No. 2.)

(13) Blow-Room Treatment in relation to leafiness in Cotton. (Technological Leaflet No. 3.)

(14) Blow-Room Treatment for a long-staple Cotton. (Technological Leaflet No. 4.)

SECRETARY'S TOURS.

47. During the year under report the Secretary visited Karachi and Indore in connection with the work of the Committee.

FINANCIAL.

48. In *Appendix X* will be found a statement showing the Receipts and Expenditure and also the Balance Sheet for the year ending 31st March 1933. Receipts amounted to Rs. 7,05,476 and expenditure to Rs. 8,08,309 against an estimated expenditure of Rs. 10,73,275.

The principal items of savings were under Administration (Rs. 30,081); Improvement of Cotton Marketing (Rs. 7,166); Seed Distribution and Extension Schemes (Rs. 64,454, two schemes sanctioned were held in abeyance); Printing and Propaganda (Rs. 11,053); Technological Research (Rs. 26,322); Research Studentships (Rs. 8,382); Co-ordination of Cotton Research (Rs. 22,679, the scheme not having started); other Bombay Schemes (Rs. 32,280); Punjab Botanical Scheme (Rs. 27,712); Central Provinces Botanical Scheme (Rs. 14,921), and the Institute of Plant Industry, Indore (Rs. 8,333). In the current year receipts are estimated at Rs. 6,44,500 and expenditure at Rs. 12,12,527. As a result of new schemes sanctioned during the year, the Committee will have to make further inroads on its accumulated balances.

CHAPTER III.

RESEARCH.

49. THE research policy of the Committee for the "improvement and development of the growing, marketing and manufacture of cotton in India" is carried out in two ways, viz., by direct control of certain branches of its activities, e.g., the Technological Laboratory at Matunga, Bombay, and by granting subsidies to Departments of Agriculture in Provinces and States for the investigation of problems mainly of all-India interest. The Committee in addition contributes a large sum of money every year to the Institute of Plant Industry, Indore, a central research station for Central India. The problems of research in Provinces and States include several schemes—botanical for securing improved strains of cotton by selection and hybridisation, physiological for investigation of crop growth, entomological for study of life-history of certain cotton pests and measures to combat them, and mycological for finding out ways to avoid loss due to *wilt* and *root rot*. The Committee also sanctions grants for the extension of improved varieties of cotton which have been evolved by Departments of Agriculture. During the year under report the Committee provided funds for 32 Agricultural Research Schemes and 15 Seed Distribution and Extension Schemes at a total estimated cost of Rs. 7,10,838. A beginning was made in propaganda work in 1931-32 in the Surat area to prevent the carry-over of the Spotted Boll-worm, and in June 1932 a special officer was appointed to carry on publicity and propaganda on the Committee's work. The Committee, in addition, offers scholarships and training grants to promising graduates and men already in service for post-graduate training in different subjects pertaining to cotton industry.

TECHNOLOGICAL LABORATORY.

50. The Report of the Director, Technological Laboratory, for 1932-33, forms Chapter V of this report. The work of the Laboratory continues to expand, and the year under report witnessed a fresh record in the number of samples, lots and yarns spun. The number of samples spun went up to 461 as against 323 of the last year, an increase of 43 per cent., and there was also a considerable increase, though not in the same proportion, in the number of lots and yarns spun. It was observed in last year's report that with the present staff and equipment the number of spinning tests made last year was about the maximum that could be expected of the Laboratory in the course of a year, but by the introduction of many labour-saving devices it was possible to carry out a much larger number of spinning tests during the year. The samples tested fell, as in the previous year, into four classes : (*i*) Agricul-

tural samples, (*ii*) Standard cottons, (*iii*) Trade samples, and (*iv*) Technological samples. The agricultural samples comprise the new selections which are still under trial and samples of cotton grown in connection with manurial, irrigation and similar other experiments, and they form nearly 70 per cent. of the total number of samples spun during the year as against 53 per cent. of the last year. The standard cottons are the improved types which are now under general cultivation in different parts of India. Tests were made on them during the past nine years with a view to correlating the data obtained from the fibre tests with the spinning quality of cotton and the results show that the influence of such fibre properties as rigidity, number of convolutions per inch and ribbon width is practically negligible as compared with mean fibre length or fibre weight per inch. Six standard cottons were tested during the year and the results were published in four-page circulars. The trade samples consist of the representative types of the commercial Indian crop of the season selected by the Standards Committee of the East India Cotton Association and the samples of first arrivals of the new crop received from the Bombay and Ahmedabad Millowners' Associations, the object of the tests being to provide the trade and the industry with information regarding their waste losses and spinning quality. Twenty-seven samples supplied by the East India Cotton Association and fifteen samples supplied by the Bombay and Ahmedabad Millowners' Associations were tested during the year and the results were published in the form of circulars. Technological samples are spun in connection with the technological research on the problems relating to the conversion of cotton fibre into yarn.

The special tests on *Banilla* cotton, the spinning quality of which has considerably deteriorated since its first introduction in Khandesh, were continued and the results were published in a Technological Bulletin. An enquiry into the causes of deterioration of cotton stacked in open plinths at Karachi was started during the year with the object of finding out whether the extent of deterioration would justify the heavy expenditure for the construction of a large number of godowns.

The investigation on the carding of short, medium and long stapled cottons was continued for finding out the effects of different settings and speed of the more important organs of the card on the composition of waste and the quality of the yarn.

As mentioned in last year's report, tests were continued on the variation of the moisture content of trade bales and a Special Sub-Committee has been appointed to examine the results of the past two years.

The Committee was honoured by His Excellency the Viceroy who was pleased to visit the Technological Laboratory in August 1933.

INSTITUTE OF PLANT INDUSTRY, INDORE.

51. The Annual Report of the Director, Institute of Plant Industry, Indore, for the year 1932-33, will be found in *Appendix II*. The Institute was opened in 1924. The primary object of the Committee in financing the

Institute is to provide a centre for cotton research for black soils of Malwa plateau and the programme of work includes the general botany, physiology and genetics of Indian cottons besides a number of agricultural investigations connected with cotton cultivation. The first seven or eight years were mainly devoted to agronomy and the combined effect of field grading, surface drainage, clean cultivation and the application of compost has considerably increased the yield of cotton on the Institute lands. Another important feature of this period is the introduction into general agricultural practice of a new process of converting all kinds of farm waste into valuable compost. The methods employed for these improvements are within the means of an ordinary cultivator and do not involve any expenditure beyond cattle and manual labour. The process of compost making has now been much simplified with a result in economy of water and labour, and is being adopted by many Indian States who are members of the Institute. The results of the comparative tests of the selections of *Malwi* cotton appear very promising and the distribution of a pure strain in Malwa tract is only a matter of a year or two. *Banilla* seems to be better suited to the Nimar tract of Central India than any of the other cottons at present grown there, but before any definite policy is laid down in regard to the type of cotton to be distributed there a few more experiments are necessary. Exposures of cotton seed, buds and pollen to X-rays have not resulted in any aberrant types. Cytological study has, however, revealed certain irregularities in the process of development of the megaspore and female gametophyte and also of cell division in root hair. Experiments were also carried out on 'leaf roll' and 'red leaf' diseases and a paper on this and allied subjects has been published. Investigations on other crops are also in progress.

SCHEMES IN PROGRESS.

Madras Presidency.

52. *The Madras Herbaceum Scheme* commenced in 1923 and was extended for two years in 1928 and again for five years from July 1930. The scheme was started with the object of securing by selection an *Uppam* (*G. herbaceum*) strain which would spin and yield as well as *Karunganni* (*G. indicum*) when grown under similar conditions in black cotton soils of the Salem and Coimbatore districts. The rainfall of these districts is low and somewhat precarious and as an insurance against failure of the rains the cultivator grows a mixture of the two cottons. *Uppam* is a hardy variety capable of giving a fair yield even under adverse conditions. *Karunganni*, on the other hand, is more profitable in years of good rainfall. The *Karunganni* strains which the Department of Agriculture is now distributing are capable of spinning up to 26s standard warp counts against 14s of *Uppam* and the intention of the scheme is to produce a high-yielding strain of *Uppam* which could spin 20s or more counts to replace the local mixture. It was, however, found out after seven years' work that *Uppam* was very unlikely to yield pure strains which would come up to the standard, and the Committee in 1930 sanctioned the extension of the scheme for a further period of five

years for securing by hybridisation what was not possible by unit selections. Out of the 16 biotypes that were selected last year from the F3 generation of a cross between *Indicum* and *Cernuum* and recrossed with an *Uppam* strain, five were found to be as good yielders as *Karunganni* and a large number of plants from each of these five families have been picked individually for study of their seed and lint characters.

Some of the cultures obtained from X-rayed pollen were found very satisfactory from the point of yield and they will be tested again next year for yield and lint characters. A large number of promising plants have also been selected from an ordinary field crop and from F2 and F3 crosses for further study. The inheritance of lint colour and the segregation of pollen colour in F3 generation of crosses were investigated and the results of the study on pollen colour are expected to be published soon. The genetics of seed and lint weight and boll size were likewise studied in F3 populations.

53. *Fodder Cholam Scheme.*—This scheme was sanctioned for three years in July 1930 and was extended in August 1933 for a further period of two years and five months from January 1934. The investigation was started in January 1931 to ascertain the causes of the harmful effects of fodder *cholam* (*Andropogon sorghum*) when compared with *cumbu* (*Pennisetum typhoideum*) on succeeding cotton. The results so far obtained are encouraging and they show that when *cholam* was allowed to run to seed the yield of succeeding cotton was reduced, but when it was cut at the short-blade stage there was no fall in yield of cotton though the quantity of fodder was reduced by 38 per cent. and its quality suffered due to the inclement weather at the time of harvest. There is, however, a possibility of getting over these difficulties and securing good yield of cotton by growing, in a suitable proportion, a mixture of late variety of *cholam* and a bulky leguminous fodder crop like *Pillipesaru* (*Phaseolus trilobatus*). The rate of percolation, as observed from sand cultures, seems greater in *cumbu* fields than in *cholam* fields, suggesting thereby that cotton after *cholam* suffers from want of proper drainage. The low yield of cotton after *cholam* does not appear to have any relation to the *cholam* stubbles left in the field. In *cholam* soils nitrification in summer is more rapid, though the total nitric nitrogen is less than in *cumbu* soils.

54. *Pempheres and Physiological Scheme.*—This scheme commenced in September 1931 and was extended in August 1933 for a period of five years from the 1st September 1933. It was first sanctioned in 1925, but due to the difficulty of securing competent officers to take charge it was held in abeyance for over five years. The Committee decided ultimately in July 1930 that two officers selected from the Madras Agricultural Department should be sent to England for post-graduate training with the object of their occupying at the end of their training the posts of Physiological Botanist and Bio-Chemist and that pending their return a beginning should be made with the preliminary work under the guidance of the Cotton Specialist, Coimbatore. One of the two officers, the Bio-Chemist, returned in August 1933, and the other is expected back next year.

The scheme consists of two parts, viz., Entomological and Physiological. The entomological part aims at an investigation into the methods of combating the Cotton Stem Borer (*Pempheres affinis*), an important pest in the Madras Presidency, and the physiological half consists of an enquiry into the causes which help the pest to be more severe on some cottons than others. The following is a brief summary of the observations made during the year :—

(*i*) The incidence of attack is lower on rain-fed cotton than on irrigated cotton.

(*ii*) The insect does not show any special liking for plants of any particular age except that it avoids seedlings of less than ten days old.

(*iii*) Some of the several varieties of cotton tested at the Cotton Research Station, Coimbatore, seem to be immune to the attack though there were wide variations in the rate of incidence which might help breeding tolerant strains, and with a view to obtain resistant strains *Cambodia* cotton was crossed with South American varieties which showed comparatively marked freedom from attack. Some unit selections were also made from plants that produce wound gum which entombs the live grubs.

Bombay Presidency.

55. *Surat Physiological Scheme.*—The Surat Physiological Scheme was started in 1923 with the object of ascertaining the causes responsible for heavy shedding of buds, flowers and bolls in Broach cotton and finding out remedial measures. The scheme was closed down in 1932 after about nine years' research and its final report was considered in August 1933 when it was decided that it should be published after the Officer-in-charge of the scheme had verified certain items of research. The research has shown that heavy shedding is natural to the cotton plant, being the result of the interaction of growth activities and inadequacy of nitrogen supply, and that in the Surat tract, where water is not a limiting factor, the yield of cotton could be increased by maintaining adequate supply of available nitrogen in the soil. The scheme has also produced a new strain of cotton which is in every respect superior to 1027 *A.L.F.*

56. *Dharwar Wilt Scheme.*—The Dharwar Wilt Scheme commenced in 1923 for the purpose of finding out suitable measures for checking the spread of *wilt* disease on local cottons in the Kumpta area. This object having failed, the Committee decided in 1928, when the scheme completed its first sanctioned period of five years, that the breeding of *wilt*-resistant varieties was the most satisfactory way of dealing with the problem and extended the scheme for a further period of five years, subject to review at the end of three years, for breeding *wilt*-resistant strains without entirely giving

up the academic side of the investigation. The Agricultural Department had in hand some promising *wilt*-resistant strains, one of which, a cross between *Dharwar* 1 and *Dharwar* 2, known as *Jayawant*, was finally selected and its seed is now being widely distributed by the Hubli and Gadag Co-operative Cotton Sale Societies by the help of a seed distribution scheme financed by the Committee. The *Wilt* Scheme was reviewed in December 1931 and closed down at the end of May 1932. The final report on the scheme was considered by the Committee in August 1933 when it was decided that it should be published in the *Indian Journal of Agricultural Science* after further verification of a few items of research. Some of the results are very helpful for testing new types of cotton for *wilt* resistance before they are distributed to the cultivator. It has been proved that the seed is one of the means of spreading the disease.

57. *The Surat Boll-worm Clean-up Scheme.*—This scheme was sanctioned in December 1931 for a period of one year. It commenced work in February 1932 and was extended in February 1933 for fourteen months and again in August 1933 for another year. This scheme is the outcome of the Surat Entomological Scheme which came to a successful termination in 1931. The object of the latter scheme was to study the life-histories of the *Spotted Boll-worms* (*Earias fabia* and *insulana*) and to devise means for reducing the loss caused by them. The investigation provided a large amount of useful information, and with a view to give practical application to the findings of this scheme the Committee sanctioned the Boll-worm Clean-up Scheme for intensive cleaning up in a selected area of 480 square miles in Gujerat, immediately after harvest, of all cotton stalks and stubbles and for eradication of alternative host plants. The scheme, however, could not be started immediately, due to unfavourable political situation in Gujerat. The Committee therefore thought it desirable to start propaganda for the purpose of establishing good relations between the Department of Agriculture and the cultivator and sanctioned a Propaganda Scheme, as distinct from the Clean-up Scheme already sanctioned. An intensive propaganda was carried on from April 1931 to the end of January 1932 to convince the cultivator that a substantial increase in yield of *kapas* could be obtained by depriving the *boll-worm* of its food supply. The propaganda was very successful, and when the Propaganda Scheme merged into the Clean-up Scheme in February 1932 the growers readily purchased a large number of plant pullers to uproot the cotton plants. The clean-up work in 1932 was not, however, quite satisfactory as nearly one-third of the area was cut as usual with *Kudali* instead of being pulled out. This gave rise to the ratoons being sprouted and the *boll-worm* being carried over, and nevertheless the incidence of the attack was fairly low in the cleaned-up area as compared with many outside centres. The clean-up work during the year under report was quite satisfactory and the result will be known at the end of the cotton season.

58. *Broach Cotton Breeding Scheme.*—This scheme was sanctioned in December 1931 for a period of five years with the object of securing for the

Nerbudda-Mahi zone a type of cotton having the qualities of *wilt* resistance and high ginning percentage, combined with good yielding and spinning capacity, and it started work in April 1932. During the year under report efforts were mainly directed to the improvement, by hybridisation, of the ginning outturn of the strain *Broach Desi* 8, a *wilt*-resistant with good spinning and fairly high yielding qualities but poor in ginning outturn.

59. *Jalgaon Cotton Breeding Scheme.*—This scheme, like the above, was sanctioned in December 1931 for five years and started work in April 1932. The object of the scheme is to obtain by selection or hybridisation a *wilt*-resistant, heavy yielding, high ginning and good spinning cotton to replace *Banilla*, a cross between *Bani* and *Comilla*, the spinning quality of which has of late deteriorated. A large number of plants selected last year were tested during the year on a highly *wilt*-infected soil and seven of them showed high resistance. The Committee supplies funds for the staff and equipment, the Government of Bombay having agreed to provide the Plant Breeder.

60. *Sind Physiological Scheme.*—The Sind Physiological Scheme commenced in July 1927 and was extended in August 1932 for a further period of five years. The scheme consists of physiological investigations of problems connected with water requirements and general physiology of the cotton plant under perennial irrigation. Particular attention was paid, during the year, to irrigation and manurial experiments and to the investigation of the 'Red Leaf' disease. The previous investigations having shown that cotton in Sind requires 36·9″ of water, an experiment was started this year to ascertain the best method of its distribution from the time of sowing. The results are not conclusive though they indicate slightly in favour of frequent irrigations. The manurial experiment for finding out the best time of application of a quick-acting nitrogenous manure fared no better due to the partial failure of the crop. The problem of 'Red Leaf' disease, which appears to be mainly responsible for the failure of long-staple American varieties, has been under investigation.

Punjab.

61. *Punjab Botanical Scheme.*—The Punjab Botanical Scheme commenced in August 1925 and was extended for a period of five years from April 1930. The scheme has for its object the investigation into the causes of the periodic 'failures' of American cotton and the selection of a suitable strain which can replace *4F* cotton in Canal Colonies where a very large area is at present occupied by this cotton. Mr. Trevor Trought produced, after five years' work, a strain which looked promising but it had to be discarded as it proved very susceptible to *jassid* attack. Luckily he had a few *jassid*-resistant strains in hand and attention is now being paid to their tests. One of these strains, *N.T.* 43, an early variety, has proved this year quite promising when sown even late and it will be tested again next year on a large scale in different localities. It gives best yield when sown early in May while the proper time for sowing *4F* is about 20th May. The manurial

experiment has shown again this year that nitrate of soda gives better yield than ammonium sulphate, and the extra yield obtained from the application of a complete mixture of artificials did not cover the cost of the manure.

62. *Punjab Entomological Scheme.*—The Punjab Entomological Scheme came up for review in August 1933, having completed the extended period of two years, and the Committee decided to close it down and continue the work on *Pink Boll-worm* as a part of a new scheme sanctioned for the investigation of certain aspects of the *Spotted Boll-worm* in the Punjab. The Entomological Scheme was started in 1926 with the object of ascertaining the reason for the difference in the incidence of the *Pink Boll-worm* (*Platyedra gossypiella*) between the South-East Punjab, where the intensity of its attack varies from 20 to 25 per cent., and the Canal Colonies, where it is practically absent. The important results up to date may be summarised as below :—

(*i*) The distribution of the *Pink Boll-worm* is mainly controlled by the temperature. It is most serious in the South-East, where the climate is cooler and more humid, and is of little consequence in the Western Punjab, including the Canal Colonies, where the weather is hot and dry. There is thus little possibility of the *Pink Boll-worm* becoming a serious pest in Canal Colonies where American cotton is extensively grown unless the climatic conditions of this region are changed, due to the extension of canal irrigation.

(*ii*) The attack is more severe on American cotton than on *Desi* cotton.

(*iii*) Light traps are effective when the temperature ranges between 76° F. and 87° F. The moths are attracted more on the night following the day on which cotton was picked than on other nights.

(*iv*) The long-cycle moth lays fewer eggs than the short-cycle moth, the highest number of eggs laid by a moth being 456. The incubation period varies from 3 days in July to 16 days in November, and at temperatures below 10° C. and above 37° C., the moth failed to lay eggs and also the eggs failed to hatch.

(*v*) The capacity of a moth to lay eggs does not depend so much upon the temperature to which it is exposed as on the temperature to which it is exposed in pupal stage. The most favourable temperature for the development of eggs in the pupa is between 24° C. and 27° C., and the moths laid the highest number of eggs at the temperature between 20° C. and 25° C.

(*vi*) The moths emerge in large numbers from long-cycle caterpillars when the temperature ranges from 30° C. to 33° C. and the relative humidity from 60 per cent. to 80 per cent. These conditions are normally reached in the Punjab in July and August.

The total duration of life cycle varies from 20 days in August to 39 days in October and as many as three to four generations are completed from July to October.

63. *The Punjab White Fly Scheme* was started in May 1931. The Department of Agriculture started work in 1928 on *White Fly* (*Bemesia gossypipdra*), a sucking insect which attacks cotton as well as other crops, and in 1929 one of the Committee's research scholars was deputed to study the pest at Khanewal where it was first observed causing damage on cotton. In December 1930 the Committee felt convinced that this pest required serious attention and sanctioned the *White Fly* Scheme for a period of three years. The important observations of the year are briefly summarised below :—

(*i*) The pest is seen all round the year. In November, when the cotton crop is about to come to a close, it spreads to weeds on which it continues to live till about May when it is seen on cucurbits and ratoon cotton. In June it begins to extend to the new crop of cotton.

(*ii*) Severe infestation in the early part of the season retards the vegetative growth. If the infestation starts when the season has advanced it leads to a striking setback in the development of reproductive organs resulting in poor yield and low ginning percentage.

(*iii*) Nitrogenous manures decrease the infestation and also the shedding and bad opening of bolls. The attack is also less severe when the crop is heavily irrigated.

(*iv*) Spraying with rosin compound or fish oil soap is very effective, and two sprayings, in July and August, gave a maximum increase of two maunds and 15 seers of cotton per acre even under unfavourable conditions.

64. *Punjab Root Rot Scheme.*—The *Root Rot* Scheme commenced work in September 1932. It was sanctioned in August 1932 for a period of three years for the purpose of studying *Root Rot* in the Punjab where, particularly in the canal-irrigated tracts, the damage done by this disease is estimated at about Rs. 16 lakhs every year. Ordinarily the disease makes its appearance in the last week of June, when the crop is about two months old, and continues up to about the middle of September. It spreads in a circle among healthy plants, and the affected ones dry up quickly. The preliminary investigations carried out a few years ago by the Department of Agriculture showed that some plants escaped the disease while others very close to them were attacked, and the seed obtained from plants not affected by the disease did not produce plants resistant to the disease. The observations of the year under report show that the disease is mainly due to two species of *Rhizoctonia* which stopped growing at 40° C. and 45° C. and died at 60° C. and 68° C. respectively ; they have also a wide range of toleration to acidity and alkalinity and may remain dormant in the soil for a long time. An attempt to spread the disease by inoculation and by bringing into contact the roots of freshly wilted plants with those of healthy ones, however, failed, and this may be ue to the experiment being started late when the plants were fully matured.

65. *Punjab White Fly Spraying Scheme.*—This scheme, as reported in last year's report, was sanctioned in August 1932 for the purpose of ascertaining the following points :—

1. The most suitable and economic insecticide and the proper time for spraying and dusting.

2. The form in which the insecticide should be applied—dust or spray.

3. The various methods and appliances for spraying and dusting the field crops. The scheme started in July 1933 and the results will be available at the end of the 1933-34 season.

Burma.

66. *The Cotton Improvement Scheme* started work in April 1931 and was extended in August 1933 for a further period of three years. The main object of the scheme is to bring home to the cultivator of the *Wagale* tract, by means of practical demonstrations, the better methods of agriculture, such as preservation and utilisation of all farm waste as manure, conservation of moisture in the soil, early preparation of the land, drill sowing, intercultivation, etc. The Committee provides funds for the employment each year of six demonstrators up to a total of 18 from the third year and for the purchase of necessary implements for demonstration. During the year under report there were 12 demonstrators in charge of 38 demonstration holdings in the four cotton districts of the tract and in three of these districts the average yield of the holdings exceeded the average district yields by over 100 per cent. Several cultivators round about the holdings adopted better methods of cultivation and preservation of manure.

Central Provinces.

67. *The Central Provinces Breeding Scheme* started work in 1923. It was extended for five years in 1928 and again for a further period of five years from the 1st April 1934. The main object of the scheme is to obtain a *wilt*-resistant, high yielding and better quality cotton for the Central Provinces and Berar. Prior to the starting of the scheme the Department of Agriculture had done some work on cotton selection and it was therefore possible to secure much earlier than otherwise a pure strain, *Verum* 262, a high yielding *wilt*-resistant variety capable of spinning up to 20s and 22s as against 8s and 10s of local mixture. It has fetched a substantial premium from the time it was put into the hands of the cultivator, and so great and rapid was the demand for the seed that in November 1929 the Indian Central Cotton Committee sanctioned a separate seed distribution scheme with the aid of which the Department of Agriculture was able to distribute during the year under report 1,052,650 lbs. of pure seed sufficient for 71,115 acres. Late *Verum*, a new promising strain, has once again proved its superiority over all other types of cotton tested during the year. It has been adjudged

suitable for spinning up to 31s and was paid during the year a premium of Rs. 10 per candy over *Verum* 262. Two other new strains, *No.* 438 and *No.* 434, are also promising and the latter, in particular, seems so well suited to varying conditions of soil and climate of this province as in early localities it is very likely to replace *Verum* 262 which is susceptible to climatic variations. Work on *Bani E.B.* 31 and *Bani* 306 continued. Attention was also devoted to the improvement of groundnut as it has proved a most suitable crop for rotation with cotton. A new strain of Spanish peanut, *Ak.* 12-24, was tried on a field scale this year and it gave an average yield of 1,400 lbs. per acre against 1,000 to 1,200 lbs. of small Japan and Spanish peanuts.

Hyderabad.

68. *The Hyderabad Botanical Research Scheme* started work in 1929 and was extended in August 1933 for a further period of five years from the 1st April 1934. The scheme has as its object the study of cottons which make up *Gaorani* or *Bani* cotton and selection of a prolific, high ginning and uniform type with good spinning qualities. *Gaorani* or *Bani*, though the best of the indigenous cottons from the point of spinning, is a poor ginner and is therefore being rapidly replaced by high-ginning short-staple *neglectums*. The Cotton Research Botanist, Parbhani, has been able to produce a number of pure strains of *Gaorani* which are being tested for yield.

69. *Hyderabad Cotton Survey Scheme.*—This scheme commenced in June 1931. It was sanctioned in December 1930 for a period of four years for a detailed survey of the cottons grown in Hyderabad State as an essential preliminary for securing superior strains of cotton and extension and distribution of their seed. A large number of samples of cotton seed obtained from as many as 115 representative villages of Nanded, Bir, Bidar, Osmanabad and Adilabad districts were tested, as last year, at Parbhani and the results show again this year that cotton grown in these districts mainly consists of three species, *G. indicum, G. neglectum and G. hirsutum* with varying proportions in different localities. These results were confirmed by the survey of the standing crop in over a hundred villages.

Baroda.

70. *The Baroda Root Rot Scheme* was sanctioned in July 1931 for a period of two years in the first instance with the object of studying *Root Rot* and breeding suitable strains of cotton resistant to this disease in Baroda State. The scheme started work in February 1932 and was extended in August 1933 for a further period of three years. The results obtained during the year show that *Root Rot* is due to three organisms, viz., *Nematodes, Fusarium-vasinfectum and Rhizoctonia bataticola,* which also appear to be responsible for similar disease on tobacco and the small-seeded variety of castor. When the crop is attacked by this disease the plants die from top to bottom, in contrast to *wilt*-infected plants, which begin withering from bottom to top.

The seed obtained from a large number of plants selected from highly infected fields for their freedom from the disease was tested and none of their progenies were found to resist *Root Rot*.

Bikaner.

71. *Bikaner Gang Canal Scheme.*—This scheme commenced work in January 1931 at Ganganagar and was sanctioned for five years for the purpose of obtaining by selection and hybridisation superior types of Indian and American cottons capable of spinning up to 25s counts. Other problems like the correct adjustment of irrigation water and the best rotation for cotton are also studied. The work of the year shows that of all cottons tested *Mollisoni* is best suited to the conditions obtaining under the Gang Canal. Punjab-American 289*F* seems to respond to sufficient water-supply after flowering.

CHAPTER IV.

SEED EXTENSION SCHEMES.

72. THE Indian Central Cotton Committee, at its nineteenth meeting held in July 1929, adopted the policy of assisting the Departments of Agriculture in wider distribution of seed of improved varieties of cotton and has sanctioned since then 16 seed distribution schemes of which four have not yet been started for one reason or other.

MADRAS PRESIDENCY.

73. *Tiruppur.*—The Committee sanctioned in 1929, for a period of five years, a scheme providing the pay of an officer to act as Grader, Adviser and Business Manager to a group of Co-operative Societies in the Coimbatore district which are growing the selected strains of Cambodia cotton and helping the Department of Agriculture in the distribution and extension of the improved seed. This scheme was amalgamated during the year with a new scheme sanctioned in August 1932 for five years, for the distribution of *Co.* 2 (*Cambodia*) seed on a large area in the Coimbatore district. The Department of Agriculture was able to arrange during the year a seed farm area of 1,988 acres for growing pure *Co.* 2 seed and to gin pure the *kapas* obtained from this area. The seed obtained from this cotton will be distributed next year.

One more scheme was sanctioned in August 1932 for the extension of *H*-1 (*G. herbaceum*) in the Westerns tract. It was not started during the year as the season for sowing of this cotton had advanced by the time it was sanctioned.

BOMBAY PRESIDENCY.

74. *Hubli.*—This scheme has completed three years, having been started in June 1930. It was sanctioned in November 1929 for five years, subject to review at the end of the third year, at a total cost of Rs. 40,800 to be divided between the Agricultural Department and the Hubli Co-operative Cotton Sale Society, Limited, for producing and distributing pure seed of *Jayawant* in the area served by the Society. The Society stocked during the year 1,091,215 lbs. pure seed out of which 620,226 lbs., enough for 61,023 acres, were distributed in the Dharwar district and the rest was supplied to the adjoining districts of the Bombay Presidency and the Hyderabad State which are included in the Kumpta-Dharwar area.

75. *Gadag* (*Extension and Supplementary*).—This scheme is similar to the Hubli scheme except that the total amount sanctioned for it is Rs. 66,323 and that the work of seed distribution is done by the Gadag Co-operative Cotton Sale Society in the area served by it. The Society was unable to sell more than 591,931 lbs. against 1,244,817 lbs. last year, due to the competition of local dealers who sold seed on credit at a rate lower than the Society could sell.

76. *Surat.*—This scheme was sanctioned in 1929 for a period of two years, subject to reconsideration at the end of that period, and it was extended in December 1931 for another two years. The scheme commenced in April 1930 and is therefore due to expire in March 1934 unless it is further extended. The scheme provides the pay of a graduate assistant and a grant for opening seed depots for sale in the Surat-Broach area of 1027 *A.L.F.* cotton seed. Twenty depots were organized during the year and they were able to distribute 2,385,434 lbs. of pure seed of which 1,778,258 lbs. were supplied to the Rajpipla, Chhota Udepur, Cambay, Jambughoda and Baroda States.

77. *Khandesh.*—In December 1930 the Committee sanctioned this scheme for a period of five years for the extension of *Banilla* cotton, a cross between *Bani* and *Comilla* cottons, in the Khandesh area, and the work of seed distribution was started in May 1931. This cotton, one of the early strains produced by the Bombay Agricultural Department, is spreading rapidly on its own merits, though it is somewhat susceptible to *wilt* and has deteriorated in spinning quality since it was first tested. A botanical scheme has been in progress to secure a more suitable strain for the Khandesh area but *Banilla*, in spite of its shortcomings, is much superior to local mixture and gives better return. Due to the season for cotton sowing in 1932-33 being abnormally late, the yield of cotton was low and the Department of Agriculture could not therefore obtain and distribute more than 473,200 lbs. of pure seed.

78. *Athani.*—The object of this scheme is the multiplication and distribution of *Jayawant* seed in the Athani taluka of the Belgaum district. The scheme is for five years and it commenced work in April 1932. A reserved area of 1,100 acres was arranged in 1932-33 at Kagwad for production of pure seed and a total quantity of 122,000 lbs. of seed was obtained.

79. *Haveri and Bailhongal.*—These schemes, though sanctioned as far back as in 1929, have not yet commenced, due to the difficulty of devising means of financing the purchase of seed.

80. *Sind.*—This scheme started work in April 1931 and was extended in August 1933 for a period of five years from April 1934. It has as its object the extension of improved cottons in the Barrage area in Sind and carrying out yield tests, demonstrations and propaganda work to facilitate the distribution of improved cottons when perennial supply for irrigation of the Barrage water was available. On the right bank of the Indus, where cotton cultivation has never been seriously attempted before, thirty demonstration plots were arranged throughout the tract during the year and the results obtained indicate that 4-*F*-18 (improved type of Punjab-American) is more suitable for this tract than 27 *W.N.* (improved *desi* type) and that soil and climatic conditions of the Dadu district are better suited for cotton than the former rice-growing areas of the Larkhana district. On the left bank of the river 27 *W. N.* has proved again this year its superiority over other cottons in respect of yield in Thar Parkar, Nawabshah and Hyderabad districts though 285-*F*-2 and 289-*F*-1 (improved varieties of Punjab-American) look promising in Jamrao tract. About 5,200 maunds of pure seed of 27 *W.N.* were distributed to cultivators.

81. *Central Provinces.*—The main object of the scheme during the year under report was (*i*) to distribute a large quantity of pure *Verum* seed as in previous years, (*ii*) to exercise a close supervision over an area of 45,000 acres which was expected to yield about 9,000 bales of ginned cotton and enough seed to cover about 180,000 acres in 1933-34, and (*iii*) to market the above 9,000 bales of pure cotton at the highest rate possible. The Department of Agriculture was able to distribute 1,052,650 lbs. of pure *Verum* seed, sufficient to sow an area of about 71,115 acres, and dispose of 3,971 bales of cotton at an average premium of Rs. 36-13-0 over *Broach* and Rs. 55-11-0 over *Oomras*. The fall in quantity of cotton sold was due to low crop yield and keen competition in some of the centres where purchasers offered higher premiums to prevent the growers from joining the pool.

82. *Hyderabad.*—The scheme commenced in March 1930 and was extended for three years from March 1933. The total quantity of pure seed distributed in 1932 in the Raichur district by the Department of Agriculture was 340,856 lbs. which was sown on an area of 18,926 acres in 104 villages.

RESEARCH STUDENTS.

83. For nearly a decade the Committee has been devoting its attention to the training of research workers in several of the sciences pertaining to cotton. Distinguished graduates from Indian Universities are selected and placed for training under experienced research workers on the Committee's schemes, at the Institute of Plant Industry, Indore, or at the Committee's Technological Laboratory. The scholarships are usually held for two years but extensions are frequently given. Fifty students have been given scholarships of whom five are still under training in India and one abroad. Six resigned before completing their training and twenty-nine have found employment on the Committee's staff or have joined Provincial or State Agricultural Departments.

The Research Students Selection Sub-Committee has decided to award its scholarships under two categories, viz., Training Grants and General Scholarships. Training Grants are intended for Government servants who are recommended by their Provincial Governments and for employees of the Committee provided they are considered fit by the Committee. The General Scholarships will be awarded to candidates selected from University graduates, application for which will be invited by advertisement as usual.

No General Scholarship was awarded during the year; two Training Grants were sanctioned.

Two Training Grants for foreign study were also awarded to the Government servants recommended by the Provincial Directors of Agriculture—one candidate was from the Bombay Presidency, while the other belonged to the Punjab.

Expenditure on Research Studentships during the ten years ending 31st August 1933 amounted to Rs. 2,11,467-6-5.

P. H. RAMA REDDI,
Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1932-33.

INTRODUCTION.

THE present report gives an account of the work done at the Technological Laboratory during the year 1st September 1932 to 31st August 1933. As will be seen from a perusal of this report, the work of the Laboratory has continued to grow and expand in the most gratifying manner. The number of agricultural and trade samples on which spinning tests were made during the year reached to the high level of 443, which establishes a new record and shows an increase of no less than 45 per cent. over the corresponding figure for the last year, while the number of samples on which only fibre tests were made rose to 119 from 60 for last year, showing an increase of nearly 100 per cent. Good progress has been made in the various investigations on the fundamental properties of cotton fibre and the manufacture of yarn from it, and fresh avenues of research have been explored. Foremost amongst the latter, mention must be made of the new method for the determination of the two important fibre-properties, viz., mean fibre-length and fibre-weight per inch, which according to the results obtained at the Laboratory have shown the most intimate relationship with the spinning quality of a cotton. A brief reference was made to this investigation in my annual report for the year ending 31st August 1932. It may now be mentioned that a rough apparatus embodying the new method was made in the workshop of the Laboratory for preliminary tests. The results obtained with this apparatus were so encouraging that arrangements were made for the manufacture of a more refined apparatus at the workshop of the Victoria Jubilee Technical Institute. The results obtained with the refined apparatus completely justified the expectations placed in the new method, and the matter was reported to the Indian Central Cotton Committee at its meeting held on the 30th August 1933 when it was decided that the new apparatus should be patented in the name of the Committee. The application for patenting this apparatus has been filed at His Majesty's Patent Office, Calcutta.

The work done at the Laboratory will now be described under the following five heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the samples tested during the period under review together with the designations of the officers supplying the samples :—

BOMBAY.

(1) *The Cotton Market Superintendent, Jamkhandi.*—1 sample of Jamkhandi cotton.

(2) *District Agricultural Overseer, Baramati.*—1 sample of Banilla cotton.

(3) *The Cotton Breeder, Jalgaon.*—14 samples of Banilla, N. R. and Local cottons from districts.

(4) *The Cotton Breeder, South Gujerat, Surat.*—40 samples from District Trial Plot experiments (1931-32) ; 4 samples of selections ; 5 samples of selections, 1A Long Boll, White Flower, etc. ; 8 samples from District Trial Plots (1932-33).

(5) *The Cotton Breeder, Government Farm, Broach.*—4 samples of Broach-Desi 8, Goghari and other selections.

(6) *The Cotton Breeder, North Gujerat, Viramgaum.*—15 samples of different crosses and selections.

(7) *The Supervisor, Cotton Tests, Navsari.*—40 samples from District Trial Plots.

(8) *The Botanist in Sind, Karachi.*—6 samples of 285F, 4F, W.N. 27 Selections.

(9) *The Cotton Assistant, Government Seed Farm, Mirpurkhas.*—5 samples of Hartsville, Boss III, Acala and other selections.

PUNJAB.

(1) *The Cotton Research Botanist, Cotton Research Laboratory, Lyallpur.*—16 samples of American Varietal Tests, 18 samples of 4F and 289F mixtures, 4 samples for effect of climate on lint, 8 samples for Desi Varietal Tests, 6 samples for watering experiments.

(2) *The B.C.G.A. (Punjab), Ltd., Khanewal.*—3 samples of selections.

UNITED PROVINCES.

(1) *The Entomologist to Government, Cawnpore.*—5 samples of damaged and undamaged locks.

(2) *The Assistant Economic Botanist to Government, Cawnpore.*—7 samples of C402 and C520 from districts.

CENTRAL PROVINCES.

(1) *The Economic Botanist to Government, Nagpur.*—3 samples of Late Verum and Bani cottons; 2 samples of Selections No. 429 and No. 438.

MADRAS.

(1) *The Superintendent, Agricultural Research Station, Koilpatti.*—19 samples from different experiments; 9 samples of pure Pulichai, Karunganni C7 and mixtures.

MISCELLANEOUS.

(1) *The Assistant Botanist, Government Experimental Farm, Hiriyur.*—3 samples of strains 21-22, strains 190 and 149-152.

(2) *The Agricultural Inspector, Devangere.*—3 samples of Selection 69.

(3) *The Agricultural Inspector, Chitaldrug District, Chitaldrug.*—3 samples of Selection 69.

(4) *The Assistant Botanist, Hiriyur.*—7 samples of different selections.

(5) *The Director, Institute of Plant Industry, Indore.*—9 samples of Malvi selections.

(6) *The Cotton Research Botanist, Parbhani.*—1 sample of Cultivators Local; 14 samples of Gaorani cottons.

(7) *The Inspector of Seed Distribution, Kopbal, Hyderabad.*—4 samples of Jayawant and other strains.

(8) *The Crop Botanist, Malwa Division, Ujjain.*—20 samples of various strains.

(9) *The Financial Secretary, Bhopal Government, Bhopal.*—1 sample of Bhopal cotton.

(10) *The Cotton Breeder, Baroda.*—2 samples of Broach and Karkhadi cottons.

(11) *The Agricultural Officer, Bukalasa Experiment Station, Bukalasa, Uganda Protectorate.*—8 samples of Uganda cottons.

It was mentioned in my last annual report that there is a growing desire on the part of the Indian States to seek the assistance of the Technological Laboratory in improving the quality of the cottons grown in their respective areas. In addition to Hyderabad and Baroda, who have been sending samples of their new strains for the last few years, many samples were received from the States of Central India and Rajputana through the Director, Institute of Plant Industry, Indore. With the growing confidence in the validity of the tests carried out at the Laboratory, even Agricultural Departments outside India have approached the Committee for a scientific valuation of their new varieties, and during the period under review eight samples were submitted for tests by the Agricultural Department of Uganda Protectorate.

As a result of the substantial increase in the work of the Laboratory the spinning and testing departments have been taxed to their utmost capacity and as the indication is that the advice and help of the Laboratory will be sought to a yet larger extent in the future it is essential that the various sections of the Laboratory which are responsible for carrying out the tests should be strengthened at an early date. The steady increase in the work of the Technological Laboratory from year to year will be seen from the following tables which give the distribution of samples, lots and yarns spun since 1924-25.

TABLE I.—*Distribution of Samples Spun*, 1924-33.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	Totals, 1924-33.
Bombay	18	26	22	22	28	66	89	69	143	483
Punjab	14	1	..	..	42	30	10	44	55	196
United Provinces ..	7	..	6	11	9	7	16	7	12	75
Madras	2	19	50	23	30	51	66	15	28	284
Central Provinces ..	2	..	3	2	2	5	3	3	5	25
Miscellaneous ..	3	11	..	6	6	27	28	33	75	189
Total ..	46	57	81	64	117	186	212	171	318	1,252
Standard Cotton Tests	8	54	49	64	33	34	27	18	18	305
Trade Tests and Special Tests ..	..	..	..	..	..	37	89	134	125	385
Total Tests ..	54	111	130	128	150	257	328	323	461	1,942

TABLE II.—*Distribution of Lots Spun*, 1924-33.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	Totals, 1924-33.
Bombay	36	52	44	44	53	107	90	69	143	638
Punjab	26	4	..	..	83	41	10	44	55	263
United Provinces ..	14	..	12	22	18	14	16	7	12	115
Madras	4	38	100	46	60	85	66	16	28	443
Central Provinces ..	3	..	6	4	4	10	4	3	5	39
Miscellaneous ..	3	22	..	12	9	33	29	33	75	216
Total ..	86	116	162	128	227	290	215	172	318	1,714
Standard Cotton Tests	34	176	142	178	68	64	54	36	36	788
Trade and Special Tests	..	..	..	..	..	37	119	186	129	471
Total Tests ..	120	292	304	306	295	391	388	394	483	2,973

TABLE III.—*Distribution of Yarns Spun*, 1924-33.

Province.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	Totals, 1924-33.
Bombay	103	152	132	132	159	322	253	203	430	1,886
Punjab	106	14	..	..	254	113	31	136	165	819
United Provinces ..	27	..	36	66	54	42	40	22	32	319
Madras	12	108	278	138	180	255	199	53	85	1,308
Central Provinces ..	8	..	18	12	12	30	12	9	15	116
Miscellaneous ..	3	58	..	36	27	99	100	93	227	643
Total	259	332	464	384	686	861	635	516	954	5,091
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	2,637
Trade and Special Tests	..	..	..	..	..	80	343	502	256	1,181
Total Tests ..	354	846	887	831	976	1,164	1,287	1,154	1,410	8,909

The figures given in these three tables are instructive. It will be seen that the number of samples tested rose from 323 for the last year to 461 for the current year, showing an increase of 43 per cent. These samples were spun into 1,410 yarns from 483 lots, the corresponding figures for the last year being 1,154 and 394. The increase in the number of lots and yarns spun is 23 per cent. and 22 per cent. respectively, which is less than that witnessed in the number of samples. This is due to the fact that in the past a much larger proportion of the samples were spun in duplicate lots, but owing to the severe demand on the resources of the Laboratory, spinning from duplicate lots is now restricted to Standard Cottons and such other samples as are of special interest.

The Laboratory has now carried out tests for the last 10 years and it is interesting to note that during the first decade of its existence it has undertaken spinning tests alone on nearly 2,000 samples of various types and descriptions and that no less than 8,900 yarns have been spun (and tested) from

nearly 3,000 lots obtained from these samples. Such a record of work in only one branch of the activities of the Laboratory is indeed gratifying.

The statement given on pages 41-43 does not make mention of the samples received either for fibre tests or yarn tests alone. A summary of the former will be found on page 54 of this report while the latter are principally received from the mills and are tested on payment of certain fees laid down by the Committee.

The results of the tests carried out on samples received for spinning tests, fibre tests and yarn tests are embodied in Technological Reports. Of these, reports on trade samples are published for general information while those on agricultural samples are sent only to the suppliers of the samples. The following table gives a summary of the various reports issued during the year under review together with the corresponding figures for the previous years :

	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
Spinning Test Reports ..	7	19	19	22	21	63	92	60	87
Fibre Test Reports	1	1	5	1	7	4	7	19	30
Yarn Test Reports	..	..	..	1	4	4	2	3	5
Total ..	8	20	24	24	32	71	101	82	122

It will be seen that under each classification a substantial increase has occurred in the number of reports issued from the Laboratory. The total number of reports issued during the year was 122, which is nearly 50 per cent. more than that for the last year. In order to cope with the present-day heavy work of the Laboratory, as shown by the number of samples tested and reports issued, many time and labour-saving devices have been introduced, with the result that it has not been found necessary to increase the staff in the same proportion. This will be seen from the following table which shows the strength of the permanent staff employed at the Laboratory from year to year since 1924 :—

As at August 31st in	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Technical staff	8	11	20	24	27	27	32	32	32	33
Research students	1	3	6	4	3	2	1	1	..	..
Fumigation chemists ..	..	..	2	4	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35

It should be mentioned here that, in order to finish the current year's samples before the arrival of the next season's crop, it was found necessary to employ, in addition to the permanent staff, four temporary Junior Testers for a period of 3 to 4 months. The bulk of the testing work falls on the shoulders of the Junior Testers who must work diligently in order to obtain

reliable results. In the case of most cottons tested at the Laboratory the mean fibre-length and fibre-weight of each sample are determined and the yarns spun examined for the lea-breaking strength, single thread strength and extension, actual counts, actual twist, yarn neppiness and yarn evenness. An idea of the amount of work involved in these tests may be had from the fact that during the year under review the number of yarn tests alone amounted to nearly three-quarter million.

Classification of Samples.

It will be seen from Tables I-III that the samples tested at the Laboratory fall into the following four divisions :—

(*a*) Agricultural samples.
(*b*) Standard cottons.
(*c*) Trade samples.
(*d*) Technological samples.

It will not be out of place to say a few words here as regards those samples which offer special features of interest.

(*a*) *Agricultural samples.*—These are received from Officers of the Provincial Agricultural Departments and constitute either the new selections which are under trial or samples grown in connection with botanical, physiological or agronomical schemes of the Committee. They form the bulk of the samples annually tested at the Laboratory, and, during the year under review, amounted to 70 per cent. of the total number of samples tested. Among these, the following samples are worthy of a passing reference :—

(1) *Manurial experiments.*—Six samples received from the Superintendent, Agricultural Research Station, Koilpatti, were grown from the same seed stock in the neighbouring plots of a field under different manurial treatments. The results of tests on these samples will be of great help in determining whether and to what extent the application of different manure affects the spinning quality of Karunganni cotton grown in Koilpatti.

(2) *Irrigation experiments.*—Last year a beginning was made towards ascertaining the influence of different rates of irrigation on the quality of 4F cotton grown in the Punjab. The results of tests carried out on samples of 4F were so instructive that the Committee decided to recommend to other Provincial Departments to make arrangements if possible for the supply of samples grown under as nearly the same conditions as possible, but with different amounts of irrigation. Accordingly such samples have been received this year from Bikaner, Sakrand, Coimbatore, and Lyallpur and are under test. The results of these tests when available should prove useful to the cultivators in these areas by placing in their hands the optimum irrigations requirement of the types grown by them. They will also be instructive in making comparisons of the influence of different irrigations on the yield and quality of the various cottons tested under this scheme.

(3) *African cottons.*—For some time past the Technological Laboratory has undertaken tests on representative samples of A. R. Kampala, A. R. Busoga and A. R. Jinja with a view to helping the East India Cotton Association, Limited, in laying down reliable standards of length for these cottons. These tests have been continued during the year under review. Furthermore, the Senior Botanist, Department of Agriculture, Cotton Laboratory, Bukalasa Experiment Station, Bombo, Uganda Protectorate, requested permission to send eight samples from his selections for tests at the Laboratory. In view of the fact that India, being one of the principal importers of the Uganda cottons, is deeply interested in improvement of their quality, the Committee gave the necessary permission for making tests on these samples.

(4) *Egyptian cottons.*—It is well known that the Provincial Agricultural Departments have tried many long-staple exotic varieties with a view to finding out whether or not these will grow on an economically profitable scale in different parts of India. It is a welcome sign of the times that this line of investigation has now been taken up by private individuals and during the year under review a sample of Maraad cotton grown by a leading mill-owner in Ahmedabad on his farm was sent to the Laboratory for tests. The results of the tests compared very favourably with those of the Egyptian varieties which are under trial at the Botanical Farm, Sakrand. It will be instructive to watch the performance of this cotton in the next few years.

(5) 1027 *A.L.F. and Selection* 1*A.*—Last year tests were made on 20 samples each of 1027 A.L.F. and Selection 1A grown in Surat. This year 40 samples of these two cottons have been received from Surat and an equal number from Baroda. These samples are being tested at the Technological Laboratory in connection with the cotton policy of the Committee in Gujerat. The rival claims of 1027 A.L.F. and Selection 1A for cultivation in Gujerat have been under consideration for some time past and in order to arrive at a decision which should be in the best interests of the cultivators the Committee decided that tests should be made on samples of these two cottons grown in the farmers' fields in Surat and Baroda. When the results of tests on these 120 samples are available they will no doubt provide definite evidence, so far as spinning quality is concerned, as regards the cotton that is best suited for cultivation in the area mentioned above.

(6) *Samples from States in Central India and Rajputana.*—Hitherto comparatively few samples of cotton have been received for tests from the Institute of Plant Industry, Indore. This year, however, as many as 40 samples were received from this source. These represent mostly cottons grown in States in Central India and Rajputana with a view to finding the best types that are suitable for cultivation in these States. The active collaboration of the Institute of Plant Industry, Indore, with the Technological Laboratory will, it is hoped, lead to beneficial results for the cultivators in Central India States and Rajputana.

(7) *Banilla cotton.*—Lastly, mention may also be made of tests carried out on six samples of Banilla cotton grown in the cultivators' fields in Khandesh. These tests were made in continuation of those undertaken in 1930-31 on 19 samples of Banilla with a view to ascertaining the average quality of this cotton and its variation in different parts of Khandesh. The results of tests on 25 samples of Banilla and a few samples of the local Roseum cotton have been published in a Technological Bulletin.

(*b*) *Standard cottons.*—These cottons represent improved types which are under cultivation in different parts of India and include such new cottons as Verum 262 and Jayawant which have been evolved as the result of the joint efforts of the Agricultural Departments and the Indian Central Cotton Committee. For the last nine years these cottons have been subjected to very thorough tests with a view to correlating the fibre test data with the spinning quality of a cotton. This practice has been continued during the current year with the modification that the number of fibre-properties that have been determined has been reduced from 7 to 4. The accumulated results of the past nine years have shown that the influence of such fibre-properties as rigidity, number of convolutions per inch, and ribbon width is extremely small as compared with that of mean fibre-length or fibre-weight per inch and that the time and labour involved in the determination of these three properties does not take us much further in predicting the spinning quality of a cotton from its fibre test results. Accordingly, it has been decided to discontinue from the current year onwards the determination of rigidity, convolutions and ribbon width except in very special cases. In view of the fact that many of the Standard cottons are now grown on a commercial scale, it has been customary to issue four-page circulars on those cottons which are received in the market early in the season. During the year under review six such circulars were issued on the following cottons :—

(1) Punjab-American 289F.
(2) Verum 262 (Akola).
(3) Umri Bani.
(4) Verum 262 (Nagpur).
(5) Punjab-American 4F.
(6) Surat 1027 A.L.F.

It may be mentioned here that a U. P. cotton, K22, has been deleted from the list of Standard cottons as it had failed to find favour with the cultivators and had gone out of cultivation. In its place a new U. P. cotton, C402, has been included. The cultivation of this cotton is being extended in the Sarda Canal area and the results of field trials have been found quite satisfactory as regards yield, stand in the field, resistance to pests, etc. Samples of this cotton have been tested at the Laboratory during the last four years and have been found suitable for spinning up to 14s/18s standard warp counts, which is a much better performance than that of the local Bengals.

It has been stated above that tests on these cottons have been undertaken with a view to correlating the spinning quality of a cotton with its fibre-properties. It is understood that a Technological Bulletin embodying the results of tests on 95 samples of these cottons has been sent for publication to the *Journal of the Textile Institute* by Dr. A. J. Turner, late Director of the Laboratory. A summary of this bulletin will be given in the next annual report, by which time it is hoped the bulletin will be out.

(c) *Trade samples.*—These samples have been tested at the Laboratory for the last four years in accordance with the arrangements arrived at between the Indian Central Cotton Committee on the one hand and the East India Cotton Association, Limited, Bombay, the Millowners' Association, Bombay, and the Millowners' Association, Ahmedabad, on the other. The object of these tests is to provide the trade and the industry with reliable information as regards the waste losses and the spinning quality of either the chief representative types of the commercial Indian crop (the East India Cotton Association samples) or the first arrivals of the new crop in any season (Bombay and Ahmedabad Millowners' Associations samples). These tests are performed as soon as the samples are received at the Laboratory and the results are published as soon as possible in the form of 2-3-page circulars which are freely distributed amongst the trade. The following statement gives the description of trade samples received for tests from these sources :—

Cottons supplied by the East India Cotton Association.

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Nanded.
5. Lattur.
6. Muttia.
7. Punjab-American.
8. Broach.
9. Jagadia Farm.
10. Surat.
11. Navsari.
12. Dholleras (Wagadia).
13. Kalagin.
14. Kadi-Viramgam.
15. Westerns (Jhavaria).
16. Farm Westerns.
17. Coompta.
18. Upland (Gadag).
19. Bijapore.
20. Bagalkote.
21. Cambodias.
22. Tinnevelly.
23. Karungannis.
24. A. R. Kampala (2 samples).
25. A. R. Busoga (,,).
26. A. R. Jinja (,,).
27. Rajpipla.

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

(*a*) BOMBAY.

1. Hubli Coompta.
2. Hubli Upland.
3. Ujjain.
4. Bailhongal.
5. Broach (Sadhli).
6. Kosi (Bengal).
7. Saudha (Khandesh).
8. Mandusar (Ujjain).
9. Padtur Farm (Moglai).
10. Navsari.
11. Farm Westerns.
12. Tiruppur Cambodia.
13. Surat.
14. Busoga African.

(*b*) AHMEDABAD.

1. Jagadia.

A list of the Technological Circulars published on these samples will be found under "Publications."

Hitherto it has been the practice to give the results for the latest season's samples only in these circulars but as most of the trade cottons are tested in the successive seasons it was felt that the informative value of the circulars would be greatly enhanced if the results of the previous tests were also included in them. Accordingly in the Technological Circulars published during the year under review not only the results for 1932-33 but also for the previous seasons were published wherever available. This improvement in the Technological Circulars should be helpful in revealing any deterioration or improvement in the quality of any one type with the lapse of time. If, after a few years' tests, it is found that any one particular growth shows persistent signs of deterioration an investigation could be taken in hand for determining the causes which have contributed to a decline in its quality, and an attempt could be made to replace it by a better variety. It is gratifying to note that these circulars on trade samples are widely quoted in the English and Continental textile journals and supply the necessary information regarding the performance of Indian cottons to millowners in these countries.

In addition to the tests on the trade samples mentioned above the following tests on special samples deserve a brief reference :—

(1) *Tests on damped and dry cottons.*—It was stated in my last annual report that with the establishment of a Moisture Testing Section at the Cotton Exchange, Sewree, arrangements were completed for the determination of the moisture content in samples drawn from representative commercial bales. Side by side with these moisture tests it was suggested by some members of the East India Cotton Association that they would welcome an enquiry into the extent of deterioration resulting from pre-humidifying cotton before it is pressed into bales. Arrangements were accordingly made to obtain samples from a sufficient number of bales of Digras and Amraoti cottons, some of these being pressed dry and the others after pre-humidification. These tests will extend over a period of about two years.

(2) *Deterioration of cotton stacked in open plinths at Karachi.*—Karachi, being the natural outlet for the agricultural produce of Sind and the Punjab, is rapidly developing as a market for exporting cotton, especially to the European countries. Unlike Bombay, however, it does not at present possess a sufficiently large number of godowns in which cotton could be stored between the arrival of the crop and its disposal. As a result a large proportion of the bales received in Karachi are stacked in open plinths in the thole yard. The atmosphere in Karachi is generally much drier than that in Bombay and therefore the necessity of having godowns has not been felt to the same extent, but the trade felt that they would welcome an enquiry into whether the extent of deterioration in quality of cotton stacked in the open, would justify the heavy costs involved in the construction of a suitably large number of godowns. With a view to helping the Karachi merchants to arrive at a decision on this important point the Indian Central Cotton Committee decided to undertake an investigation on this point. For this purpose six bales each of Sind-Desi, Punjab-Desi and Punjab-American—the three types which form the bulk of the cotton received in Karachi—were purchased and spinning tests were made on samples drawn from these bales. These were then re-pressed by hand and divided into two groups of 9 bales each ; one group was placed inside a godown and the other in the thole yard. At intervals of 6 or 7 months three bales from each group will be opened up, samples will be drawn and subjected to the usual spinning tests. The investigation will therefore last for a period of about two years, at the end of which it will be possible to compare the behaviour of the bales stacked in the thole yard with that of the bales stored inside the godown. In connection with this investigation my thanks are due to Messrs. Volkart Bros., Karachi, for their kindness in allowing me the use of a portion of their godown and shed and for their valuable assistance in sampling the bales.

(3) A sample of cotton containing an unusually large amount of leaf was received from one of the local mills. It was divided into three lots and each lot was given a different blow-room treatment with a view to finding out the best treatment which would remove the leaf without weakening the yarns spun from it. The results of these tests were published in a Technological leaflet.

(4) A sample of Sudan Sakel cotton was received from one of the Ahmedabad mills. It was divided into three lots and each lot was spun into suitable counts after being given a different blow-room treatment. The object of these tests was to find out the optimum blow-room treatment for a long and fine cotton and the results were published in a Technological leaflet.

(5) In addition to the tests described above, the assistance of the Laboratory was sought in the solution of sundry problems relating to the textile industry. Among these the following are worthy of mention :—

(*i*) A sample of grey cloth suffering badly from an attack of mildew was submitted by one of the local mills. It was subjected to a thorough examination, the nature of the fungus responsible for the mildew was determined and a treatment was found and recommended which, if applied, would prevent the mildew from spreading further even under the unfavourable circumstances of storage in a damp godown.

(*ii*) It was brought to the notice of the writer that cotton coming from a certain area in Sind had suffered badly from the effects of defective ginning. A sample of this cotton was tested at the Laboratory. The Technological Research Sub-Committee, after considering the results of tests on this sample, decided that a note should be prepared for circulation among the ginning factory owners in that area giving them detailed instructions as regards the proper use of roller gins. This note was prepared and sent to the Chief Agricultural Officer, Sind, for circulation.

(*iii*) Two samples of cotton were received from the Collector of Salt Revenue, Bombay. These samples had been drawn from bales imported in Porbunder and were alleged to be of an Egyptian and an Indian cotton respectively. The Collector of Salt Revenue was anxious to know whether the statement made by the importer was correct or whether some American cotton was being surreptitiously imported in Porbunder under false pretences. Tests for identification were made on these two samples and the conclusions were communicated to the Collector of Salt Revenue, Bombay.

(6) It was stated in my last annual report that in view of the rapidly increasing number of samples sent for tests by individual mills for their own benefit, the Indian Central Cotton Committee laid down a scale of fees for the carrying out of such tests at the Laboratory. The practical application of this scale showed that it was desirable to modify it with a view to meeting the specific requirements of the mills intending to avail themselves of the facilities offered by the Laboratory. This was accordingly done with the sanction of the Committee. The modified scale is as follows :—

SCALE OF FEES.

		Rs.	a.	p.
(1)	*Fibre or Yarn Test :*			
	(*a*) Mean fibre-length	7	8	0
	(*b*) Fibre-weight per inch	7	8	0
	(*c*) Fibre-strength	10	0	0
	(*d*) Maturity	7	8	0
	(*e*) Lea test	7	8	0
	(*f*) Ballistic test.	7	8	0
	(*g*) Single thread test	7	8	0
	(*h*) Twist	7	8	0

		Rs.	a.	p.
(2)	*Fibre and Blow-room Test:*			
	(*a*)—Fibre tests—As for (*a*)—(*d*) above.			
	(*b*) Blow-room only	10	0	0
(3)	*Full Test:*			
	(*a*) Fibre-tests—As for (*a*)—(*d*) above.			
	(*b*) Spinning test only	35	0	0
	(*c*) ,, ,, on combed cotton	50	0	0

These fees came into force in January 1933 and up to 31st August 1933 twenty-seven samples, received from the mills, were tested. This number is made up of 3 samples for spinning tests, 18 for fibre tests and 6 for yarn tests.

(7) Lastly, it may be mentioned that the East India Cotton Association, Bombay, issues an annual publication entitled "Bombay Cotton Annual." This publication contains an importment statement showing the waste losses and the spinning performance of the various trade descriptions. Hitherto, this statement had been based mainly on the tests made at different times by the local mills. As samples of fair average quality of many of the trade descriptions had been subjected to the spinning tests at the Laboratory during the last four years the East India Cotton Association asked if a new statement could be prepared in the light of the results obtained. This was done and the statement has been incorporated in the most recent issue (No. 13) of the publication referred to above.

(*d*) *Technological samples.*—These samples are spun in connection with the various problems relating to the conversion of cotton fibre into yarn which are undertaken at the Laboratory alongside of the routine work. They are, however, put through, as opportunity permits, in between the agricultural and the trade samples. Their number, therefore, depends, to a large extent, upon the number of agricultural and trade samples submitted for tests at the Laboratory. It will be seen from Table III that in spite of the rush of the agricultural and the trade samples good progress was made in the work on the technological problems, among which the following deserve mention.

Carding problems.—It was stated in my previous annual reports that a system, i.e., investigation on the carding of cotton, was undertaken at the Laboratory some time ago. Three cottons, representing a short, a medium and a long staple cotton, were selected for this purpose and the influence of different settings and speeds of the more important organs of the card on the composition of the waste and the quality of the yarn was investigated. The experimental work involved the spinning of a large number of samples, determination of the fibre-properties of waste and raw material and examin.

ation of the yarns spun for strength, evenness, etc. Most of the samples have been tested in this manner, a few yet remain to be tested, and it is hoped the investigation will be brought to an end in the course of next year.

Ginning tests.—This investigation has been undertaken with a view to determining the relationship between the ginning conditions of a cotton and the degree of neppiness of the yarns spun from it. Samples of *kapas* of eight Indian cottons representing a fairly wide range of fibre-properties were procured for this purpose and have been ginned in a roller gin and a saw gin. While keeping in mind the main object of the problem, advantage was taken to study at the same time the influence on the quality of yarn of different speeds in the saw gin and different knife-roller settings in the roller gin. All the samples have now been ginned and are waiting for a suitable opportunity to be spun into appropriate counts.

II. RESEARCH LABORATORY.

Fibre-testing Section.—This section has been fully occupied in carrying out fibre-tests on Standard cottons, agricultural samples and such samples as are received for an examination of their fibre-properties alone. The fibre-tests on the agricultural samples are usually limited to the measurement of staple length by Balls Sorter and Baer Sorter and the determination of fibre-weight per inch. In some cases where it is felt that a determination of fibre-strength will help the Cotton Breeder in choosing between similar strains, this property is also measured. The small samples on which only fibre tests are made pertain to cottons which are yet in the initial stages of experimentation and from which further selections are made on a consideration of the results of fibre tests. The following statement gives a summary of the samples tested for fibre-properties only together with the designation of the officers supplying the samples :—

(1) *The Cotton Breeder, Surat.*—2 samples of Goghari cotton.

(2) *The Cotton Breeder, Broach.*—One sample of Broach-Desi, 2 samples of New Selections, one sample of 1027 x W8 (7-1) and 2 samples of Goghari cotton.

(3) *The Cotton Breeder, Khandesh, Jalgaon*—.One sample of Bani.

(4) *The Cotton Research Botanist, H. E. H. the Nizam's Dominions, Parbhani.*—22 samples of Gaorani cotton, 13 samples of Parbhani, one of Havri, 8 samples of Hyderabad-American and 8 samples of Hyderabad-Egyptian.

(5) *The Cotton Supervisor, Indus Right Bank, Dadu.*—One sample of 4F-18, one sample of 289F-1 and one sample of W. N. 27.

(6) *The Director, Institute of Plant Industry, Indore.*—One sample of Ashmouni, one of Badnawar-Egyptian, 4 samples of Cambodia, 3 samples of Malvi, one sample of each of R., N and W and 4 samples of 289F.

(7) *The Superintendent, Baroda Experimental Station, Baroda.*—3 samples of Broach-9, one sample of Rozi and one sample of Khanam.

(8) *The East India Cotton Association, Ltd., Bombay.*—5 samples of each of A. R. Kampla, A. R. Busoga and A. R. Jinja (African cottons).

(9) *Mr. M. R. Dokras, Chandur.*—One sample of Chandur strain.

(10) *Messrs. W. H. Brady & Co., Ltd., Bombay.*—12 samples of W. H. B., two samples of Bani, 2 samples of Havri and one sample of 1" American Standard.

(11) *The Bharatkhand Textile Manufacturing Co., Ltd., Ahmedabad.*—One sample of Egyptian cotton grown at Ahmedabad.

The total number of samples tested for fibre-tests during the year under review was 119 as against 60 for the last year, showing an increase of nearly 100 per cent. Among these samples those which deserve special mention are as follows :—

Uganda cottons.—Fibre-length tests on samples of fair average quality of A. R. Kampala, A. R. Busoga and A. R. Jinja have been made at the Laboratory since July 1931. These tests were undertaken at the request of the East India Cotton Association with a view to helping the Association in laying down standards of length for these growths. Up to 31st August 1933, 45 samples of these cottons have been tested and 15 fibre-test reports were issued on each set of three samples. In April 1933 a final report summarising the results of tests made on 39 samples was submitted to the East India Cotton Association. It was considered by their Special Appeal Committee on African Cottons on the 28th June 1933, who arrived at certain tentative conclusions as regards the standards of length for these cottons on the basis of the results obtained at the Laboratory, and recommended that as some samples of the 1932-33 season have already been tested these tests may be continued to the end of the current season. They furthermore expressed their appreciation of the help given by the Laboratory, as will be seen from the following extract from a letter from the Secretary of the East India Cotton Association, Ltd., Bombay :—

> " The Committee placed on record their sense of appreciation of the very useful work done by the Technological Laboratory and especially the Director, Dr. Ahmad, in connection with the experimental tests on Uganda cotton.

Malvi and Cambodia cottons.—Samples of these two cottons grown in Indore, (1) before monsoon on irrigation and irrigated after rains, (2) on rains and irrigated after rains, and (3) grown under barani conditions, were received and tested for fibre-properties. It was found that Cambodia cotton sown before monsoon on irrigation and irrigated after rains showed an improvement in length by 5 to 10 per cent., while no such improvement was observed in the case of Malvi cottons.

Mr. Hari Rao has continued to supervise the work of this section, and in addition, has made good progress with his investigation on the effect of twist on the strength of cotton fibre. Mr. Hari Rao has now completed these tests on two cottons, namely, Cambodia and Mollisoni, and is extending them to Verum 262 in order to include a medium-staple cotton in the range of his investigation.

Physics Section.—In collaboration with Mr. R. P. Richardson, Mr. D. F. Kapadia has continued his investigation on the carding problems, to which a reference has been made above. The experimental part of this investigation is now nearly completed and Mr. Kapadia is now engaged in making tests on the remaining few samples and analysing the results prior to their publication in the form of a Technological Bulletin.

Mr. R. S. Koshal went on study leave combined with privilege leave to Rothamsted Experimental Station where he worked under the supervision of Dr. R. A. Fisher. I am glad to say that Mr. Koshal made very good use of his time at Rothamsted and the reports on his work received from Dr. Fisher were most satisfactory. During his stay at Rothamsted Mr. Koshal tackled the following two statistical problems:—

(1) Application of the method of maximum likelihood to the improvement of curves fitted by the method of moments.

(2) Effect of rainfall and temperature on percolation through drain gauges.

The results of his investigation on the first problem have already been published in the *Journal of the Royal Statistical Society*, while an account of his work on the second problem is in the press. Since his return to the Laboratory Mr. Koshal has been engaged on the study of the characteristics of fluorescent light given out by the exotic and indigenous Indian cottons when irradiated by ultra-violet rays. This work is in progress.

Mr. C. Nanjundayya has been engaged for part of the period under review on developing the new apparatus for the determination of the staple length and fibre-weight per inch of cotton. On the completion of this work Mr. Nanjundayya has reverted to his old problem of the determination of the relationship between the length and strength of cotton fibre. Since it was felt that a knowledge of the fibre-weight of fibres falling in each length

grade would be of great assistance in elucidating the results of his investigation, Mr. Nanjundayya, in collaboration with Dr. Ram Narain Mathur, has determined the fibre-weight of different length grades of all the cottons on which he had previously made strength tests. The experimental part of this investigation has now been completed and the results are being analysed with a view to their publication in the form of a Technological Bulletin.

Dr. R. N. Mathur has devoted a part of the period under review in assisting Mr. Nanjundayya in the determination of the fibre-weight of fibres falling in different length grades of the cottons tested by Mr. Nanjundayya. Since in the case of each cotton fibre-weight tests had to be made on several length grades and in all nine cottons were examined this work proved laborious and absorbed a great deal of Dr. Mathur's time. On the completion of this work Dr. Mathur has reverted to his own problem of examination of relationship between the ribbon width as determined by an improved method and the other properties of cotton fibre.

Chemistry Section.—As in the past Mr. D. L. Sen has continued making moisture tests on samples of cotton drawn from commercial bales of different trade descriptions. An account of the work done in this connection will be found under the head "Moisture Testing Section." In addition, Mr. Sen has completed his investigation on the chemical analysis on samples of Cambodia cotton grown in the adjoining plots of two fields in the two seasons 1928-29 and 1929-30. The cultivation of these samples was identical in all respects except that they were treated with different manures containing nitrogen, phosphorus and potassium. The chemical analysis of each sample of cotton consisted in the determination of the ash percentage, the nitrogen content and the phosphorus content. Furthermore, in each case the mean fibre-length and fibre-weight per inch were found and the sample was spun into suitable counts. Thus, the effect of different manurial treatment on the yield, the major fibre-properties, the spinning performance and the chemical constitution of the fibre could be studied and correlated for the 16 samples which formed the material for this investigation. An account of this work is being written up and will be published in the form of a Technological Bulletin. Mr. Sen has, in addition, carried out tests on the wax content of 12 samples representing well-known commercial types. Though the amount of wax on the cotton fibre is small, it plays an important part in the bleaching and dyeing processes and has besides a close bearing with the feel of cotton as estimated by the Grader. The primary object of this investigation was to ascertain whether it is possible to establish an empirical relationship between the feel and the wax content of a cotton. In order to reduce the errors of personal judgment in estimating the feel of cotton to a minimum, arrangements were made for examination of these cottons by three expert graders. My thanks are due to Mr. R. G. Saraiya of Messrs. Narandas Rajaram & Co., not only for suggesting this problem but for kindly supplying the samples required for this investigation. A note containing the results of this investigation will be published in due course.

Microscopy Section.—With the growing realisation of the importance of maturity of cotton fibre many requests have been received during the year under review from the Cotton Breeders to the effect that in addition to the customary fibre-tests a maturity count should also be made on the samples submitted by them. These maturity tests have in all cases been made by Mr. Gulati who has consequently devoted a part of the period under review to determination of the maturity percentage in the agricultural samples. In addition, Mr. Gulati has carried out strength and maturity tests on 15 cottons in connection with his main investigation on the relationship between degree of maturity of cotton fibre and the neppiness of yarn spun from it. An account of this investigation is in the course of preparation and will be published in due course in the form of a Technological Bulletin.

III. MOISTURE TESTING SECTION.

It will be recalled that the work in this section fell into three divisions : (1) Study of the variation in the moisture content of bales of different Indian cottons stored in the Cotton Exchange Building, Sewree, with atmospheric humidity; (2) Determination of the moisture content in specially pressed bales, and (3) Determination of the moisture content in trade bales. The first investigation was completed last year, and during the year under review a detailed account of it has been published in the form of a Technological Bulletin, a summary of which will be found on page 61. The second investigation was also completed some time ago and a summary of the results obtained was considered by the Technological Research Sub-Committee at its meeting held on the 16th November 1931. During the period under review the third investigation was pushed forward and between 1st September 1932 and 31st August 1933, another 111 samples of cotton drawn from trade bales were tested for moisture content. This figure does not include another 29 samples which have been tested in connection with the effect of pre-humidification on the spinning quality of cotton, to which a reference has been made on page 50. Since altogether 576 samples drawn from commercial bales have been tested since the commencement of this work it was felt that sufficient data is now available to draw the necessary conclusions. The Technological Research Sub-Committee considered this matter at its meeting held on 28th August 1933 and appointed a small Sub-Committee to consider the results of moisture tests relating to the second and the third investigations.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins, Circulars and Leaflets issued during the period under review :—

I. Technological Bulletins, Series A, Nos. 22, 23 and 24.

(1) Series A, No. 22, October 1932, Technological Report on Banilla Cotton, 1930-32, by Nazir Ahmad, M.Sc., Ph.D.

(2) Series A, No. 23, June 1933, Variation in the Moisture Content of Baled Indian Cotton with Atmospheric Humidity, by Nazir Ahmad, M.Sc., Ph.D.

(3) Series A, No. 24, July 1933, Technological Reports on Standard Indian Cottons, 1933, by Nazir Ahmad, M.Sc., Ph.D.

II. Technological Bulletins, Series B, Nos. 15 and 16.

(1) Series B, No. 15, October 1932, Examination of a Proposed Relationship between the Lea Test and the Single Thread Test results, by V. Venkataraman, M.A., and Nazir Ahmad, M.Sc., Ph.D.

(2) Series B, No. 16, May 1933, Fibre-Length Irregularity in Cotton, by Nazir Ahmad, M.Sc., Ph.D., and Harirao Navkal, M.Sc.

III. Technological Circulars, Nos. 81 to 103, as under :—

Circular No.	Cottons.	Date of publication.
81	A. R. Kampala, A. R. Busoga, and A.R. Jinja Cottons, 1931-32	October 1932.
82	Punjab-American 289F, 1932-33	December 1932.
83	Verum 262 (Akola), 1932-33	January 1933.
84	Bengals and Ujjain Cottons, 1932-33	January 1933.
85	Khandesh and Moglai Cottons, 1932-33	January 1933.
86	Umri Bani, 1932-33	January 1933.
87	Verum 262 (Nagpur), 1932-33	January 1933.
88	Ujjain Cotton, 1932-33	February 1933.
89	Punjab-American 4F, 1932-33	March 1933.
90	Broach Cotton, 1932-33	March 1933.
91	Khandesh Cotton, 1932-33	April 1933.
92	C. P. No. 1 and Berar Cottons, 1932-33	April 1933.
93	Latur and Nanded Cottons, 1932-33	April 1933.
94	Surat 1027 A.L.F., 1932-33	April 1933.
95	Hubli Kumpta and Hubli Upland Cottons, 1932-33 ..	April 1933.
96	Surat, Tiruppur, Cambodia, and African Busoga Cottons, 1932-33	May 1933.
97	Bailhongal and Farm Western Cottons, 1932-33 ..	May 1933.
98	Jagadia Cotton, 1932-33	May 1933.
99	Navsari Cotton, 1932-33	May 1933.
100	Broach and Surat Cottons, 1932-33	June 1933.
101	Navsari, Jagadia and Rajpipla Cottons, 1933	June 1933.
102	Dholleras and Kadi-Viramgam Cottons, 1932-33 ..	August 1933.
103	Muttia and Kalagin Cottons, 1932-33	August 1933.

IV. Leaflets, Nos. 1, 2, 3 and 4.

(1) Leaflet 1, Harmful Effects of Adulterating Good Quality Indian Cottons, September 1932.

(2) Leaflet 2, Note on Green-stained Sind-American Cotton, October 1932.

(3) Leaflet 3, Blow-room Treatment in relation to Leafiness in Cotton, March 1933.

(4) Blow-room Treatment for a Long-staple Cotton, April 1933.

Reference has already been made to the special features of Technological Reports on Standard Indian Cottons, 1933 ; the following are the summaries of the other bulletins and leaflets :—

I. (1) *Series A, No.* 22, *Technological Report on Banilla Cotton* 1930-32.—The present report contains the results of tests on 25 field samples of Banilla cotton grown in 1930-31 and 1931-32 in different parts of Khandesh. Results of tests on samples received since 1926-27 from the Government Agricultural Farms at Dhulia and Jalgaon in Khandesh are also included for purposes of comparison. The following conclusions are arrived at :—

1. In the same season the mean fibre-length and the fibre-weight per inch of Banilla cotton grown in different parts of Khandesh may show considerable variation as between one sample and another. According to the coefficient of variation test, the cotton is " very variable" in respect of mean fibre-length, and " variable " in respect of fibre-weight per inch.

2. In different seasons samples of Banilla cotton grown at the same place may show large differences in respect of either of the two above-mentioned fibre-properties.

3. The average values of mean fibre-length and fibre-weight per inch for the 1930-31 crop are $0{\cdot}73''$ and $0{\cdot}180 \times 10^{-6}$ oz. respectively.

4. Yarns spun from the Banilla cotton are generally " even " in 12's and " fairly even " in 16's counts. In most cases yarns are practically free of neps.

5. The average performance of the present-day Banilla crop corresponds to 14's standard warp counts. As in the case of fibre-properties, however, some of the samples have given decidedly better, others poorer, results than the average.

6. The Banilla cotton is, on the whole, somewhat longer and appreciably finer than the local (N.R.) Roseum cotton, and is generally capable of being spun into higher counts.

7. On the whole, samples grown in East Khandesh have given a better performance than those grown in West Khandesh. Samples grown in neighbouring villages in the same taluka have generally given very nearly equal performance.

(2) *Series A, No. 23, Variation in the Moisture Content of Baled Indian Cotton with Atmospheric Humidity.*—A knowledge of the variation in the weight and the moisture content of a bale of cotton, stored in an atmosphere of fluctuating humidity, is important to all sections of the cotton trade and industry. The object of the present report is to describe the methods and results of an investigation undertaken at the Technological Laboratory, with the above-mentioned object, on fully pressed bales of three different types of Indian cotton, viz., Broach, Berar and Bengals, of two seasons, 1930-32. Two methods were used. In the first the bales were weighed at regular intervals on a sensitive weighing machine. In the second, a sensitive automatic device, designed at the Laboratory and capable of giving a continuous record of the variation in the weight of a bale, was employed. At the end of each experiment the bale was opened and representative samples were drawn from it for the determination of the moisture content. This was done by two methods—in a conditioning oven and in a dessicator oven P_2O_5—for the 1930-31 bales and one method—conditioning oven—in the case of the 1931-32 bales. Complete record of atmospheric humidity and temperature was maintained by means of thermo-hygrographs. The average weekly humidity was found from the thermo-hygrograph charts by a new method involving the use of a planimeter. The results are presented in the form of tables and graphs and the following conclusions are drawn :—

(1) If a bale of cotton is near its saturation point for a given humidity, it will almost immediately start losing moisture if the humidity comes down, but if it is in an unsaturated state, a temporary fall in humidity will, at the most, only diminish its rate of absorption of moisture.

(2) The *rate* of absorption of moisture by a bale, depends, to a very large extent, upon the amount of moisture already held by it. As its thirst for moisture is gradually satisfied, it becomes more and more sluggish in picking up additional moisture, even when the prevailing humidity is fairly high. If it is left in an atmosphere of any given humidity for a sufficient length of time, equilibrium is established between the atmosphere and the bale; it becomes fully saturated with moisture and its weight remains stationary so long as the humidity does not change. In practice, owing to the constant fluctuations in atmospheric humidity, such a state of affairs is more the exception than the rule.

(3) A close agreement is observed between the values obtained for the absorption of moisture by loose cotton and by a fully pressed bale. It leads one to the conclusion that diffusion of moisture in a bale of cotton takes place at a quicker rate than generally conceded and that the whole problem of absorption of moisture by cotton, pressed to different degrees of compression, requires to be thoroughly investigated.

(4) If, owing to a large change in the atmospheric humidity, a bale of cotton is picking up or losing moisture at a high rate, a short-lived change in humidity in the opposite direction produces but a small effect on the trend or rate of absorption or loss of moisture by the bale.

(5) From the middle of February to the third week of June, when the humidity showed a definite upward trend in the godown, the bales, on the whole, kept on gaining in weight, though occasionally, they lost a few ounces as a result of a drop in the atmospheric humidity. A characteristic feature of this period is that sometimes small changes in humidity produce relatively large changes in the moisture content and the weight of the bales, which persist in absorbing or losing moisture for some time after the humidity has changed its direction. It appears as if the bale, with a comparatively low moisture content, is in an unstable state, ready to follow changes in humidity with an alacrity which makes it overshoot the mark. This offers a sharp contrast to their behaviour immediately before or after the monsoon when in absorbing or losing moisture at a high rate, they ignore short-lived fluctuations in atmospheric humidity.

(6) Comparing the Broach and the Berar bales kept in a godown, we find that the latter showed a higher rate than the former both in absorption and loss of moisture although the maximum percentage of moisture which they held during the monsoon was the same in the case of both bales. We also notice that when the humidity fell the Berar bale retained a larger quantity of moisture than the Broach bale.

(7) If, after the monsoon, cotton bales are stored for about four months in a relatively dry place, where the atmospheric humidity is about 40 per cent. R.H., they will give out practically all the moisture absorbed by them during the monsoon.

(8) From a study of the continuous record of the variation in the weight of a bale, we find that a moderately large drop in humidity which occupies or lasts for a few hours will wring a little moisture out of the bale, but a drop of the same magnitude, which is transitory, will leave no impression on it. Furthermore, with a moisture content of about 8 per cent. the bale is more inclined to lose than to absorb moisture in an atmosphere of fluctuating humidity. But if the humidity subsequently increases by about 15 per cent. and stays at the higher value for a few days, it will restart picking up moisture, and do so at the rate of about 1 oz. per day. With a similar increase in humidity but with a lower initial moisture content the rate of absorption would be appreciably greater.

(9) Comparison of the behaviour of the Broach, the Berar and the Bengals bales, stored under identical conditions, shows that, starting with practically the same moisture content as the Bengals bale, the Broach bale absorbed moisture at a higher rate in an atmosphere of ascending humidity, so that, by the end of the monsoon, it had absorbed nearly $1\frac{1}{2}$ lbs. more moisture than the Bengals bale, and its moisture content was found to be nearly 0·4 per cent. higher. The Berar bale started with a lower moisture content than either the Broach or the Bengals bale. It, however, picked up moisture at first at a much higher rate than either of the other two bales, thereby greatly reducing the initial difference, but later on slackened its rate

of absorption and when the monsoon came to an end, although it had absorbed nearly 12 lbs. of moisture as against 10½ lbs. and 9 lbs. respectively for the Broach and the Bengals bales, its moisture content was still appreciably lower than that of the former and slightly lower than that of the latter bale. At the cessation of the monsoon, when the atmospheric humidity descended, the rate of loss of moisture was very nearly the same for the Berar and the Bengals bale, while it was appreciably higher for the Broach bale, so that when the bales recorded their lowest weight for the season, the moisture content of all the three bales stood at practically the same value. Thus the Broach bale, which absorbed water at a higher rate, also showed greater propensity for parting with it.

(10) The important fact, definitely established by these experiments, that different varieties of cotton, stored under identical conditions, absorb or lose moisture at different rates may, on elementary considerations, be thought to have some relationship with the amount of natural wax on the surface of the fibres. The results of the present experiments, however, do not uphold this conjecture. The Broach cotton generally contains more wax per unit weight than the Berar cotton, the latter more than the Bengals. Nevertheless, we fail to observe any sequence, one way or the other, in the rates of absorption of the three cottons. The length or the fineness of staple of these cottons appears to have some bearing on the rate of absorption, as the Bengals cotton, which possesses the shortest and the coarsest staple among the three selected for these experiments, generally, absorbed at a lower rate than either Broach or Berar. However, in view of the several exceptions to this observation, the relationship, if it exists, is either a complex one, or so feeble as to be masked by other factors. It is pointed out that if the absorption of moisture by cotton is more in the nature of chemical hydration than mechanical combination, its rate would depend upon the ultimate and fine structure of the fibre, which probably would not be similar in all respects in the different varieties of cotton.

II. (1) *Series B, No.* 15, *Examination of a Proposed Relationship between the Lea Test and the Single Thread Test Results.*—In *The Textile Weekly* of 8th April 1932, Gregson has suggested a method of predicting the lea breaking strength of a yarn from an analysis of the individual results of its single thread test. As his conclusions were based upon the behaviour of only one yarn, it was not possible for him to infer either the general applicability or the limitations of his method. The present paper describes the results of application of Gregson's method, with the above-mentioned two objects, to 144 carded and combed yarns, spun from the Standard Indian Cottons into counts ranging from 6's to 80's. The following conclusions are derived :—

(1) The lea strength, as obtained by Gregson's method, is generally greater than the observed lea strength when the lea ratio

$$\frac{\text{lea strength (lb.)} \times 100}{160 \times \text{mean single thread strength (lb.)}}$$

is less than 70, and less than the observed lea strength when the lea ratio is greater than 70.

(2) The percentage differences between the calculated and the observed lea strengths are comparatively small only if the lea ratio lies between 67 and 77. In almost all other cases the percentage differences are quite large, i.e., Gregson's method breaks down completely.

(3) Even when the lea ratio lies between 67 and 77 the agreement between the calculated and the observed lea strength is not always very good—a discrepancy of 5 per cent. is quite common, of 10 per cent. not uncommon.

(4) There is apparently no relation between the counts and "lea-ratio," so that unless a lea test is actually performed it is not possible to foretell the "lea ratio" of a yarn.

(5) In view of the above conclusions, the only practical application of Gregson's method is that, when both tests are performed, it can serve as a check upon the lea test results in those cases in which the lea ratio lies between 67 and 77. It cannot be used to predict the lea strength in any and every case.

(6) Even in the case of similar yarns, spun from duplicate lots of the same cotton, the percentage differences between the calculated and the observed lea strength may sometimes assume large values. This is probably due to the different degrees of irregularities in the structure of yarn which are revealed more minutely by the single thread test than by the lea test.

(2) *Series B, No.* 16, *Fibre-Length Irregularity in Cotton.*—The importance of regularity of staple, besides its length, has long been recognised by the spinners and other practical men engaged in the textile industry. Hitherto, with one recent exception, no objective method has been put forward for determining the staple irregularity of a cotton from experimental data. The object of this paper is to suggest such a method, to apply it to a large number of cottons tested at the Technological Laboratory, and to examine the results obtained with reference to their chief fibre-properties and spinning performance. It is pointed out that the most rational way of calculating the fibre-length irregularity of a cotton would be to base it upon some property indicative of its length, and reasons are advanced for selecting for this purpose the modal in preference to the mean fibre-length. Accordingly the fibre-length irregularity is defined as the percentage ratio by weight of all the fibres in a representative sample which measure less than three-fourths of the modal length.

Values of fibre-length irregularity, calculated according to the method described above, are given for 63 Standard Indian Cottons and 30 agricultural samples. The results for the Standard Cottons and the simple correlation coefficient between mean fibre-length and irregularity show that the comparatively long cottons have a tendency to be somewhat more irregular

than the short ones. This, however, is *not* always the case, and the anomaly completely disappears when we consider the results and the correlation coefficient for the agricultural samples, which cover a much wider range of fibre-properties than the Standard Cottons.

Values of simple and multiple correlation coefficients between the highest standard warp counts, the mean fibre-length, the fibre-weight per inch, and fibre-length irregularity are given for both series of samples, and their inter-relationships are discussed. It is found that the inclusion of fibre-length irregularity does not raise the multiple correlation coefficient between the highest standard warp counts and mean fibre-length and fibre-weight per inch. It is pointed out that this correlation is already so high (0·906 for the Standard Cottons and 0·937 for the agricultural samples) that unless a fibre-property be compatible in importance with length and weight, its effect in modifying the correlation coefficient is likely to be small.

The present method is compared with an earlier one, described by Clegg in the *Journal of the Textile Institute*, for calculating a similar property called " percentage short hairs."

IV. In accordance with the decision of the Indian Central Cotton Committee, a summary of Bulletin *Series A, No. 20, on Spinning Tests on Mixings of Long-staple and Short-staple Indian Cottons*, was published in Leaflet No. 1, which has already appeared in the last annual report. The following is a summary of the other three leaflets published during the year:—

(2) *Leaflet No.* 2.—Sind-American cotton, grown in the Jamrao Canal areas in Sind, has lately suffered from a decline in price owing to the appearance of " green stain " caused mainly by the removal, in ginning, of thick green fuzz from the seed. The results of various tests performed at the Technological Laboratory on stained and unstained samples of this cotton have shown that the fibre-properties of the stained cotton (machine-ginned) are not very different from those of the unstained sample, that yarns spun from the former are very nearly as strong as those given by the latter and that, after undergoing normal bleaching treatment, these yarns are indistinguishable from those obtained from the unstained sample. Similar comparative tests made eleven years ago in the United States on different types of stained cotton also gave parallel results. It may, therefore, be concluded that the mere presence of green stain in Sind-American cotton would not adversely affect its spinning quality to an appreciable extent and that yarns spun from such a cotton could be bleached satisfactorily to whiteness by the normal process employed in a mill. It follows that for the manufacture of bleached goods at least the presence of a small amount of green stain should not be taken as serious defect in the cotton, though for cloth which is to be sold in the loom state the unstained cotton will be preferred.

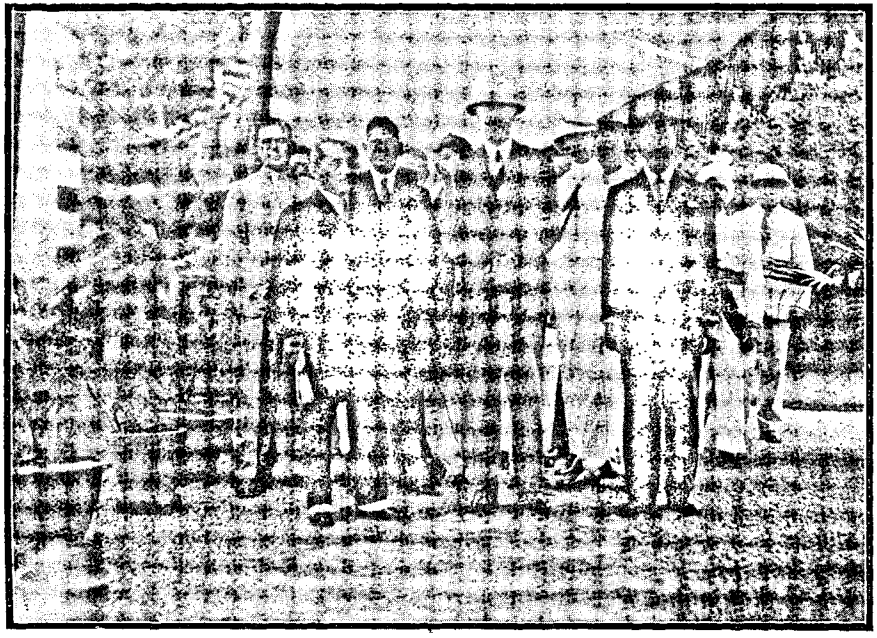
(3) *Leaflet No.* 3.—The tests described in this leaflet were made on a particularly leafy sample of Porbunder cotton submitted by a local mill. The conclusions arrived at may be summed up thus: The intensified blow-room treatment was found to be slightly more effective than the normal

treatment in removing the adhesive leaf from the fibre, but even with the most rigorous treatment adopted, the resulting yarns were distressingly leafy. At the same time, it most probably damaged the fibre, as a result of which the number of yarn breakages in the ring frame, especially in the higher counts, shot up to an uneconomical figure, yarns became distinctively less even and showed a decline in strength. In view of this it is recommended that greater care should be exercised at the time of picking the cotton—a practice which, if followed, is bound to bring better monetary return to the agriculturists. The owners of ginning factories can also materially help in improving the class of Indian cottons by cleaning the *kapas* on cots before ginning and using properly adjusted *kapas* openers. If, in spite of these measures, leaf is still found to adhere to cloth manufactured from a cotton, the use of a cropping machine is recommended.

(4) *Leaflet No.* 4.—The tests described in this leaflet were made upon a sample of Sudan Sakel cotton, which was sent to the Laboratory by an Ahmedabad mill. The machinery in the blow-room of the Technological Laboratory was installed some 10 years ago for dealing with Indian cottons and is not altogether suited for the treatment of long-staple foreign varieties. The tests had, therefore, to be performed under the limitations imposed by the existing blow-room machinery. The only reason why in spite of these limitations the tests were undertaken was to show that great care is necessary in the handling of such cottons, because of the marked influence which the blow-room treatment has upon their spinning performance. The results of these tests may be summed up as below: Making the blow-room treatment mild (only one passage through the Crighton Opener and the Scutcher) slightly reduced the blow-room loss, increased the card loss and made the yarns stronger and more even but neppy. Making the blow-room treatment milder still (the same number of passages as above but the Crighton Beater speed reduced from 750 r.p.m. to 550 r.p.m.) further reduced the blow-room loss, but made the yarns weak and neppier still, though it did not affect their evenness adversely. On the whole, therefore, the treatment given to lot 2 was found to be the optimum treatment for this cotton, as it resulted in yarns possessing the highest strength and evenness class.

V. GENERAL.

Visit of His Excellency the Viceroy.—His Excellency the Viceroy honoured the Laboratory by a visit on the 14th August 1933. His Excellency was received at the entrance by Mr. S. D. Saklatwala, Mr. P. H. Rama Reddy and the writer. Invitations had previously been issued to the members of the Standing Finance Sub-Committee and Technological Research Sub-Committee, and Mr. S. D. Saklatwala introduced the members present on the occasion to His Excellency. As the party inspected the different sections of the Laboratory, His Excellency put numerous questions regarding the various researches in progress at the Laboratory such as the analysis of cotton by ultra-violet light, the determination of fibre-maturity, the wax content, etc. He evinced keen interest in the new method evolved at the



His Excellency The Viceroy proceeding to the Spinning Laboratory after visiting the Research Laboratory.

Laboratory for the determination of staple length and fibre-weight of cotton. The party then proceeded to the Spinning and the Yarn Testing Sections where the various processes in the manufacture of carded and combed yarn from Indian cottons and the determination of their various characteristics were demonstrated to His Excellency who showed himself fully alive to the welfare of the cotton trade and industry by making enquiries about the improved types developed as a result of the efforts of the Indian Central Cotton Committee, especially those under trial in Sind. His Excellency was pleased to express his appreciation of the work done at the Laboratory and as a memento of his visit presented signed photographs of himself and Lady Willingdon to the Laboratory.

Staff.—The staff of the Laboratory as at 31st August 1933 was as follows :—

Director.—Nazir Ahmad, M.Sc., Ph.D.

RESEARCH LABORATORY.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc.; Ram Saran Koshal, M.Sc.

Junior Research Assistant.—C. Nanjundayya, M.Sc.

Temporary Research Assistant.—R. N. Mathur, D.Sc.

Junior Testing Assistants.—S. S. Sukthankar, L.T.C. ; K. G. Deo ; K. S. Marar, B.A., LL.B. ; R. G. Panvalkar, B.Sc. ; S. Samson, B.Sc. ; M. A. Gangat, B.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc., Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Draughtsman.—B. G. Mehta.

Instrument Maker.—Moreshwar M. Patke.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, F.T.I.

Senior Research Assistant.—

(*Assistant Technologist*).—D. F. Kapadia, M.Sc., Tech., B.A.

Yarn Testing Section :—

Statistician and Personal Assistant.—V. Venkataraman, M.A.

Junior Testing Assistants.—H. B. B. Joshi, B.Sc.; G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—M. T. Sundaram, M. A. Marar.

Laboratory Keeper.—H. P. Sethna, B.Sc.

Mr. R. S. Koshal, who was granted one year's study leave combined with privilege leave, returned from England on the 26th May 1933 after completion of the course of studies prescribed for him.

Messrs. C. T. Korula, L.T.M., and M. A. Gangat, B.Sc., were appointed Temporary Junior Testers for a period of three months each with effect from 22nd September 1932. Mr. M. A. Gangat's temporary appointment was extended up to 28th February 1933, after which he was appointed as Junior Tester in the post newly created. In order to cope with the additional work resulting from the receipt of a large number of samples this year, four temporary posts were created, one for a period of three months and three for a period of four months. Mr. C. T. Korula, L.T.M., was appointed to the first post, and Messrs. R. H. Kutar, L.T.M.; A. B. Pathan, B.Sc.; and R. Hurry, B.Sc., were appointed to the latter three posts.

Mr. V. Venkataraman was appointed as Personal Assistant in addition to his own post as Statistician with effect from 1st September 1932. Mr. H.B. Joshi, Junior Testing Assistant, was placed in charge of the Yarn Testing Section with effect from the same date.

Exhibits.—The preparation of cotton and yarn exhibits from improved Indian cottons for purposes of display at Fairs and Exhibitions with a view to popularising the use of Indian cottons has now become an annual feature of the activities of the Laboratory. During the period under review one set of 10 cases containing exhibits detailed below was sent to Exhibitions which were held at Pandharpur and Ujjain :—

Exhibits comprising (1) raw cotton, (2) card sliver, (3) ¼-hank yarn knots, (4) yarn bobbins, (5) black winding cards, and (6) halo length cards were prepared from the following 10 cottons :—

(1) Jayawant.
(2) Gadag 1.
(3) Surat 1027 A.L.F.
(4) Wagad 8.
(5) Umri Bani.
(6) Verum 262 (Nagpur).
(7) Nandyal 14.
(8) Hagari 1.
(9) Cambodia Co. 2.
(10) Punjab-American 4F.

The World's Grain Exhibition and Conference was held in Regina, Canada, in July-August 1933, and the Imperial Council of Agricultural Research having decided to participate in it, asked the Laboratory to prepare suitable exhibits from improved Indian cottons for display in the said Exhibition. The following cottons were selected for this purpose :—

(1) Surat 1027 A.L.F.
(2) Verum 262 (Nagpur).
(3) Umri Bani.
(4) Punjab-American 289F.
(5) Punjab-American 4F.
(6) Hagari 1.
(7) Nandyal, 14.
(8) Jayawant.
(9) Banilla.

From each of these cottons the following exhibits were prepared and sent to the World's Grain Exhibition and Conference, Regina, Canada :—

(1) Halo length cards.
(2) Card sliver.

(3) ½-hank yarn knots.
(4) Yarn bobbins.
(5) Black winding cards.
(6) Seed cotton.
(7) Seed.

Furthermore, two cases containing card-web prepared from (1) a neppy cotton and (2) a nep-free cotton were supplied to the Director, Institute of Plant Industry, Indore, for exhibition purposes.

Apparatus and equipment.—The equipment of the Laboratory was strengthened during the period under review by the acquisition of the following machinery and apparatus :—

(1) Goodbrand's Lea Tester with motor.
(2) Bawtree's Improved Colorimeter.
(3) Dr. Carl Zeiss' Universal Monochromator for visible and ultra-violet spectra.
(4) Leitz Ultro-pak equipment.
(5) Heraus Mercury Quartz Lamp.
(6) Tweedales and Smalley's Jack Roving Frame, with 56 spindles.
(7) Platt Bros. Double Roller Gin, 40″ wide.
(8) Tweedales and Smalley's 2-bladed Beater for Scutcher.

ACKNOWLEDGMENTS.

My sincere thanks are due to the office-bearers of the Indian Central Cotton Committee for their unfailing support and many valuable suggestions; to W. Ellis Jones, Esq., for his kindness in furnishing valuation reports which form an integral part of the reports issued from the Laboratory; to office-bearers of the East India Cotton Association, especially Seth Haridas Madhodas, Seth Purshotamdas Jivandas and Mr. C. M. Parikh, for giving full facilities in the tests on moisture content of Indian cottons; and to Messrs. Volkart Bros., Karachi, for valuable assistance in the investigation of the deterioration of cotton stored at Karachi. My thanks are also due to members of the staff of the Laboratory who, by their loyal co-operation, have contributed greatly to the completion of the work described in this report.

NAZIR AHMAD,
Director, Technological Laboratory.

Dated the 14th November 1933.

CHAPTER VI.

REPORT OF THE PUBLICITY AND PROPAGANDA OFFICER FOR THE YEAR ENDING 31st AUGUST 1933.

INTRODUCTION.

THE Publicity and Propaganda Scheme of the Indian Central Cotton Committee covers a wide range of activities, from the broadcasting of information which has for its object the furtherance of the material prospects of the Committee's constituents—the producer, the consumer and the exporter of cotton—by every conceivable means—the Press, Posters, Bulletins, Leaflets, Lectures, Lantern Slides, etc., to the organization of stands at Exhibitions and Fairs, at which are displayed exhibits of standard Indian cottons, trade charts, diagrams, photographs and poster informational matter.

During the year under review, the publicity secured by the Indian Central Cotton Committee was steady and continuous. India was kept in the forefront among the cotton growing and manufacturing countries, and every endeavour was made to keep the publicity and propaganda up to a high standard both in subject-matter and in the variety of subjects circulated. Newspapers served a useful purpose in bringing to the door of the grower the results of the labours of the Committee to improve the quality, yield and money value of cotton, and disseminated knowledge of the ways and means the Committee has forged to find wider markets for the produce. Other forms of propaganda have been equally successful in catering for the needs of those interests whose fate is linked up with cotton from the seed stage up to the time it enters the mill. Apart from the scientific make-up of the material, all the tricks of illustrated journalism, including reproduction of pictures representing the many-sided activities of the Committee, were utilised, to make them more lively and popular.

INFORMATIONAL PUBLICITY EXTENDED.

Two important features may be stressed. Firstly, the broadcast of literature and Press *communiqués* in various vernaculars. Secondly, propaganda in Britain and other countries in favour of various improvements effected in Indian cotton. Such propaganda is bound to have a far-reaching international importance, as importers of Indian cotton in Britain, the Continent, Japan and China will be well posted with the realities of important improvements effected in Indian cotton. The vernacular newspapers, we are glad to say, have evinced intelligent and enthusiastic interest in Press *communiqués*, every facility having been afforded them to encourage the publication of these *communiqués in extenso*.

An outstanding event of the year was the further expansion in the circulation of informational publicity matter prepared by this Department of the Indian Central Cotton Committee; and one, which should be of considerable value to India, took place from the beginning of the formation of the Indian Cotton Enquiry Committee at Manchester, when arrangements were made for wide distribution of propaganda material. Likewise the publicity network over foreign newspapers and magazines was enlarged, and recognised journals like the *Cotton Trade Journal*, U. S. A., and *The International Review of Agriculture*, Rome, gave wide publicity to the Committee's efforts. The British Press continued to show high appreciation by allowing much valuable space for the Committee's reports, and we owe a debt of gratitude to the *Manchester Guardian* and the London *Times* for assistance rendered in this connection.

EXHIBITIONS.

During the year the Publicity Department participated in the following two exhibitions:—

1. *The Pandharpur Agricultural, Cattle and Village Improvement Show.*—This Exhibition was held under the auspices of the Village Improvement Committee of Sholapur, from November 8th to 14th, 1932, at Pandharpur, a centre of pilgrimage which attracts some 200,000 people, mostly cultivators, from the surrounding districts. The Publicity Department of the Indian Central Cotton Committee organised a stall where exhibits of standard Indian cottons prepared by the Technological Laboratory, Matunga, were displayed and their qualities and performances explained. The site allotted was prominently situated. A four-coloured poster in English, Marathi, Gujerati and Kanarese, showing the efforts of the Indian Central Cotton Committee to make Indian cotton supreme in the world's cotton markets, was prominently exhibited. Interesting statistics and diagrams showed the National and International importance of cotton to India. Besides, a number of charts showing ginning percentage of various standard cottons, graphs showing the relation between supply and prices of cotton (ginned) in the Ahmedabad market and consumption of Indian cottons were likewise displayed. Special illustrated folders in English, Marathi, Gujerati and Kanarese, describing the objects and activities of the Indian Central Cotton Committee, were distributed freely. These leaflets proved an effective means of diffusing knowledge about the Committee and aroused much interest. Questions asked by the more advanced sections of cultivators and manufacturers of cotton were answered. Talks and lectures were given. An opportunity was taken to drive home important improvements effected in the cotton belt of the Bombay Presidency. This resulted in a number of enquiries which covered practically the whole of the Committee's activities, the majority being on cotton pests and diseases.

The Exhibition was opened by His Excellency Sir Frederick Sykes, Governor of Bombay; local Maratha Chiefs and other people of importance evinced keen interest in the display arranged by the Publicity Department, and the attendance was gratifying.

At the conclusion of the Exhibition the Show Committee awarded a "Certificate of Merit" in token of their appreciation of the work exhibited by the Publicity Department of the Indian Central Cotton Committee.

2. Another exhibition in which the Publicity Department took part was the *Industrial Exhibition of the Gwalior Durbar* during the Ujjain Fair in April-May 1933. Through the courtesy of the Crop Botanist, Malwa, and the Singhasth Committee, the Publicity Stall organised for the occasion attracted attention from growers, traders and the public, and was the object of admiration by visitors. Numerous enquiries of a general nature emanated from the distribution of leaflets and other publicity material concerning the improvements carried out in Indian cotton during the last decade and indicated quite clearly that the people had begun to realise increasingly the value of work done by the Committee.

In his letter No. 2122, dated the 23rd May 1933, the Crop Botanist conveyed to us "the sense of appreciation that the public interested in cotton expressed at the information contained in the posters," which were given a very prominent place. They also expressed "a good deal of satisfaction at the good cause of the Indian Central Cotton Committee, as evidenced by a study of the literature sent by you."

PRESS *COMMUNIQUÉS*.

An exhaustive study was made of some of the schemes operating in various provinces in this country, and the Press and the public were enlightened on interesting findings and results of economic value achieved by various workers :—

1. **The 25th Meeting of the Indian Central Cotton Committee.**—Report of the meeting held in Bombay on the 1st and 2nd August 1932.

2. **Sind Physiological Scheme.**—Describing cotton cultivation under the Lloyd Barrage Canals and the revolutionary change in the agriculture of Sind.

3. **Spinning Tests of Commercial Indian Cottons.**—Describing the work of the Technological Laboratory at Matunga and the great benefit derived by the trade.

4. **Training in Cotton Tests.**—Arrangements for two students to be trained at the Technological Laboratory.

5. **Use of Long-staple Cotton by Indian Mills.**—A detailed examination of the proposition that there is a wastage of wealth owing to the practice in Indian mills of using long-stapled Indian cotton for the production of yarns of lower denominations than the cotton was actually suited to spin, and that on this account either the mills or the cultivators of cotton suffered.

6. **Protection to the Grower of Long-staple Indian Cotton** against the influx of foreign cottons.

7. **Khandesh Cotton Breeding Scheme,** showing how the growers get better monetary returns as a result of the campaign against cotton wilt disease.

8. **Campaign against Cotton Wilt Disease in C. P.**—Useful results obtained by Research work and two high yielding and resistant strains evolved.

9. **Promising Results of Dharwar Wilt Research Scheme.**—How cotton growers are aided to fight a deadly enemy.

10. **Variation in the Properties of Cotton Fibre** in relation to its position on the surface of the seed. (Review of Technological Bulletins, Series B, No. 14.)

11. **Technological Report on Banilla Cotton, 1930-32.**—(Review of Technological Bulletins, Series A, No. 22.)

12. **Harmful Effects of Adulterating Good Quality Indian Cottons.**—(Review of Technological Bulletins, Series A, No. 20.)

13. **Green-stained Sind-American Cotton.**—(Review of a leaflet published by the Director of the Technological Laboratory.)

14. **Madras Herbaceum Scheme.**—Efforts to evolve a strain possessing the yield and spinning quality of *Karunganni*, with the colour, lint and well-developed root-system of *Uppam*.

15. **Impurity in Tenderable Quantity in Indian Cottons.**—Exhaustive experiments to tackle the problems by means of seed distribution schemes.

16. **26th Meeting of the Indian Central Cotton Committee in Karachi.**—A report of important decisions taken by the Committee at the meeting on February 2nd and 3rd, 1933.

17. **Revised Schedule of Fees for Tests at the Technological Laboratory.**

18. **Annual Report of the Indian Central Cotton Committee.**—A summary describing the activities of the Committee; legislation for the better growing and marketing of cotton; compilation of statistics of value to the trade; agricultural and technological research to enable the Committee to offer produce of higher economic value to growers and manufacturers, and broadcasting of information to create public interest in India's greatest industry.

19. **Cotton Research in the Punjab.**—Work done during the cotton season of 1932-33 in investigating various botanical and agricultural problems of the cotton crop, showing a decided improvement in both the yield and quality of cotton produced in the province.

20. **Some Problems of Cotton Growing and its Rotation Crops in the Central Provinces and Berar** and the work hitherto done on them by the Botanical Section, Nagpur, and at the Akola Farm under the auspices of the Indian Central Cotton Committee. A study of outstanding achievements of immense value to cotton growers and the trade by the isolation, propagation, and expansion of the new *Verum* cottons.

21. **War on Boll-worm in Broach District.**—A survey (illustrated by a map) of the intensive campaign for combating this pest, which has been causing very serious damage to the cotton crop in South Gujerat.

22. **Pink Boll-worm in the Punjab.**—Study of the pest in relation to its environmental conditions such as effects of temperature and humidity on the life of the worm in its various stages.

23. **Punjab Root-Rot Scheme.**—Investigation under progress to control this disease, which causes an annual loss of over Rs. 16,00,000.

24. **Marketing of "Verum" Cotton and Seed Distribution in the Central Provinces and Berar.**—A detailed description of the co-operative scheme started in 1930-31 with the object of securing an adequate price for the growers and maintaining supplies of pure seed.

25. **Improvement of Broach Cotton.**—An account of the research carried on at the Government Farm, Broach, now financed by the Committee, to improve the ginning outturn of *Broach-Deshi* 8 and other promising hybridised strains.

26. **Notification of the 27th Meeting of the Indian Central Cotton Committee with a list** of important subjects coming up for discussion.

27. **Development of Cotton Growing in Sind.**—Work done under the auspices of and financed by the Indian Central Cotton Committee, as reviewed by the Chief Agricultural Officer in Sind in his annual report for 1931-32.

28. **27th Meeting of the Indian Central Cotton Committee.**—Report of the proceedings, including a comprehensive summary of important decisions taken by the Committee.

29. **Hyderabad Botanical Scheme.**—Study of *Gaorani* and the experiments to evolve a strain which will not only have the spinning qualities associated with this cotton but will also possess other suitable economic characters of good yield and ginning outturn of the short-stapled varieties.

30. **Fumigation of Foreign Cotton.**—Measures for prevention of invasion of foreign insect pests.

PAMPHLETS.

An illustrated folder describing the objects and achievements of the Indian Central Cotton Committee was published in English, Marathi, Gujerati and Kanarese. It was freely distributed at the Pandharpur Show (as mentioned above). Copies were also sent to various associations and individuals interested in cotton. The demand for the folder was so heavy that it was translated into Hindi, Urdu and Sindhi and published as a pamphlet of a high standard with improved printing and attractive reproduction of illustrations. Copies in their respective vernaculars were distributed widely to cotton associations, trade organisations, district and tahsil agricultural associations in Sind, the Punjab, United Provinces and Central Provinces, the Press, etc. They were also sent to respective provincial Agricultural Departments for free distribution.

English copies of the pamphlets "The Indian Central Cotton Committee," revised edition of the "Physiology of the Cotton Plant in Sind" and the "Khandesh Cotton Breeding Scheme" were forwarded to the cotton trade and agricultural research and industrial organisations all over India as well as abroad. Favourable Press reviews appeared and enquiries followed. For example, the *Empire Cotton Growing Review*, London, referring to the first pamphlet, wrote:—"This useful bulletin gives a brief resumé of the subject for which the Committee was constituted, its chief functions and its varied activities . . . . is furnished with several good illustrations."

It is pleasing to note that several other journals of standing reproduced important points from our pamphlets in their issues. The Mysore Agricultural and Experimental Union took pains to publish an 18-page article on the activities of the Indian Central Cotton Committee in their Kanarese Journal, reproducing all the illustrations from our pamphlet.

LEAFLETS.

Broach Clean-up Propaganda Campaign.

2,000 copies of an illustrated leaflet in Gujerati entitled "*Get more money for your cotton crop by removing roots with a plant puller and thus exterminate the Boll-worm*" were printed and distributed in the Broach district during the clean-up propaganda campaign. Illustrations of the plant puller at work and those of a protected and unprotected plant were featured prominently. The leaflet reviewed relevant facts and figures based upon special investigations that were carried out in Gujerat under the auspices of the Indian Central Cotton Committee, and besides disclosing many new traits of the Spotted Boll-worm, urged the use of cheap and efficient control measures to exterminate the pest.

Another illustrated leaflet, of which 10,000 copies were printed and distributed in the same district for the same purpose, was entitled "*Would you like to exchange one rupee for one rupeee four annas? Join the war against the Boll-worm.*" The leaflet showed how this pest robbed the cotton growers of profits earned by hard labour and advised them to use plant pullers.

Our efforts to help the work of the clean-up campaign in Broach were well received.

Up to the end of the period of operations during the current year nearly 10,000 plant pullers had been sold to cultivators.

POSTERS.

A four-colour poster was printed in English, Marathi, Gujerati, Hindi, Urdu and Kanarese, describing the national and international importance of cotton in India. Owing to the large number of requests from all over the country for the poster, a reprint had to be ordered. Tamil and Gurmukhi were the additional vernaculars.

Some journals, notably the *Indian Textile Journal* (Bombay), *The Textile Manufacturer* (Manchester) and the *Bombay Chronicle* enhanced the publicity value of the poster by reproducing it in their pages.

BROACH PROPAGANDA.

The Publicity Officer took the opportunity of his visits to Broach to lend a hand in the furtherance of the clean-up campaign and carried on vigorous propaganda among cultivators of the taluqa to ensure the campaign being brought to a successful termination within the scheduled time. Every indication showed that the growers appreciated the advice and assistance given. A Press *communiqué*, with a map of the area of operation, was subsequently issued, describing the necessity of the clean-up methods recommended by the Agricultural Department, which performed a useful rôle in keeping the general public informed of the work of the Indian Central Cotton Committee and the Bombay Department of Agriculture in the districts. In addition two small illustrated leaflets, 2,000 and 10,000 each in number, giving information which proved useful to those who were thinking of joining the campaign, were distributed.

The campaign was a great success and the Publicity Officer, who attended the prize-distribution ceremony to competing cotton growers, prepared an account for the Press showing the value of the work done. The Press showed its high appreciation of the work done by giving wide publicity to this function, the report being accompanied in some journals by photographs.

FOREIGN PROPAGANDA.

Events in Britain and other parts of the world were closely followed with a view to taking advantage of any opportunity which might give an impetus to Indian cotton. Functioning as the Information Bureau of the Indian Central Cotton Committee, the Publicity Department issued Press *communiqués* as well as other publicity material to important cotton growing and manufacturing organisations. The Chairman and the Secretary, Indian Cotton Enquiry Committee, Manchester, were provided with all the publicity material available. Other organisations which received the Publicity Department's attention were the Empire Marketing Board (London), Indian Government Trade Commissioner (Hamburg), Manchester Cotton Association (Manchester), Liverpool Cotton Association (Liverpool), International Federation of Master Cotton Spinners' and Manufacturers' Associations (Manchester), Empire Cotton Growing Corporation (London), and British Cotton Growing Association (Manchester).

Publicity material and Press *communiqués* were also sent to Britain, the Continent of Europe, the U.S.A., China, Japan, East Africa, South Africa, Malaya and Australia. It is gratifying to note that the material resulted in an increased number of enquiries being made from the Publicity Bureau.

In addition to the usual publicity material the Publicity Department supplied all the special articles, *communiqués* and illustrated bulletins, with a view to stimulating the demand for Indian cotton by Lancashire mills and thus give effect to clause 8 of the Ottawa Agreement.

Appreciations of great importance were received from the Indian Cotton Enquiry Committee, the Lancashire Trade Delegation and others which showed an interest in the possibilities of increased use of Indian cotton out in the West.

ADVERTISING ON RAILWAY STATIONS.

Posters issued by the Publicity Department of the Committee are displayed at railway stations situated in various important cotton centres—Bombay, Surat, Baroda, Ahmedabad, Indore, Nagpur, Jalgaon, Akola, and Gwalior in English, Marathi, Hindi and Gujerati. As soon as the present contract expires it is proposed to make a new contract selecting other stations and other vernaculars. It is not possible to have a large number of posters displayed simultaneously owing to the high charges for such publicity.

LANTERN SLIDES.

The Publicity Department has undertaken to prepare a representative set of magic-lantern slides, illustrating findings of practical economic value from the varied research schemes of the Indian Central Cotton Committee for lectures in the *mofussil.*

Provincial Directors of Agriculture have been approached to assist and offer criticism of the ideas that have been circulated. In this connection full advantage will be taken of visits to provinces ; and suggestions in consultation with agricultural authorities will be properly followed up.

TOURS.

During the year the Publicity Officer visited various cotton centres to study local problems on the spot as well as to educate cultivators, traders and manufacturers of cotton regarding the objects, activities and achievements of the Indian Central Cotton Committee. At the Pandharpur Agricultural and Village Improvement Show a series of talks was given on methods to improve cotton crops, the need of modern implements and machinery, and organisation of business on sound economic lines. During an extensive tour of the Central Provinces and Berar which included Nagpur, Amraoti, Akola, Khamgaon, Mehkar and Chikli, the work of the Committee in evolving new varieties of cotton with better staple, bigger yield and larger profits, was explained. Similarly, during a tour of the cotton belt of the Punjab, his instructions on the advantages of proper tillage and inter-culture aroused great enthusiasm. The necessity of (1) eliminating preventible losses, (2) increasing the outturn, was emphasized on the growers. The Publicity Officer took advantage of his presence at the half-yearly meeting of the full Committee at Karachi to do some propaganda work in Sind. Such work evoked great interest in the Press, as may be seen from the Press reports published in the " Abstract Proceedings of the 26th meeting of the Indian Central Cotton Committee held on the 2nd and 3rd February 1933."

CONCLUSION.

In spite of the general gloom and the prolonged depression in trade, the propaganda material circulated by the Publicity Department of the Committee appeared to be of considerable interest to the public, which welcomed it as an instrument for bigger and better yield of cotton.

The effort to give all possible publicity to the diversified activities of such an important Committee with the limited means at the Publicity Officer's disposal was not easy. Publicity work, to be of any value, must be attractive; and attractive publications, posters, and exhibits cost money. But a serious effort has been made to grapple with this deficiency of funds, and it is worthy of note that the progress made has been sufficiently definite and the Publicity Department is steadily extending the scope of its usefulness by all conceivable methods.

APPENDIX I.

LIST OF RESOLUTIONS.

"The Indian Central Cotton Committee is of opinion that the practical method of increasing the use of Indian cotton in Lancashire is to give a tariff preference to Indian cotton by levying a duty on non-Empire cottons. In the meantime (1) the Technological Research Sub-Committee be instructed to take up the question of the best means of utilising Article 8 of the Ottawa Trade Agreement and to collaborate with the Committee established in Lancashire, and (2) any member of the Sub-Committee or of the Indian Central Cotton Committee visiting England during 1933 be invited to get into touch with the Lancashire Committee."

"That steps be taken to introduce Universal Standards for Indian cottons for use in India itself and the Local Sub-Committee be instructed to prepare a scheme for the purpose in conjunction with the various trade associations."

"That the Indian Central Cotton Committee appoints a Cotton Forecast Improvement Committee to meet as soon as possible after the publication of the Final Cotton Forecast* and to prepare a report on the degree of accuracy of the all-India Cotton Forecasts with recommendations for its improvement in future."

"That the Central Cotton Committee invites proposals from the Agricultural Departments of the cotton growing provinces and States for a study of the village consumption of cotton in India and these proposals be considered at the next meeting of the Committee."

"That the Karachi Joint Cotton Committee be invited to consider the possibility of securing an annual census of cotton stocks as in Bombay, and a similar representation be made to trade bodies in Madras, Calcutta, Tuticorin and other important places."

"That the Indian Central Cotton Committee notes with satisfaction the strides that have been made with regard to the organization of the cotton market in Karachi as is evident from the report of the Karachi Joint Cotton Committee for the period 1927-32. This Committee feels that the affairs of the Karachi Joint Cotton Committee have reached a stage at which its conversion into a separate Cotton Association seems very desirable."

"The Indian Central Cotton Committee regrets to find that the procedure laid down in Government of India's letter No. 1858-Agri., dated the 5th December 1931, referred to in the Committee's resolution No. 22, dated 15th December 1931, has failed to achieve its object. On the contrary, it has led to results which were contemplated neither by the Committee nor by Government. These results which are summarised in the Memorandum attached involve the impairment of the Committee's statutory control over the application of the Cotton Cess Fund, its ability to guide and direct the research work which it finances, its control over the scientific research staff which has been built up in the last nine years, and its ability to secure qualified research workers in the future. The Committee is impelled to request the Government of India to reconsider the decision contained in their letter quoted above as the objects for which the Committee was constituted by the Legislature are likely to be defeated."

"That the Indian Central Cotton Committee expresses its great appreciation and conveys its thanks to the Karachi Chamber of Commerce for the kind way in

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* At present called the Supplementary General Memorandum on the Cotton Crop and published in April.

which they have provided the Committee with all the facilities for holding its meeting at Karachi."

"That the Indian Central Cotton Committee re-affirms its resolution of 1924 recommending to the Government of India that the Cotton Ginning and Pressing Factories Act should contain a clause providing for the licensing of gins and presses and that this clause should be made operative on each province by resolution of the Provincial Legislative Councils."

"The Indian Central Cotton Committee congratulates the Government of Bombay for the steps taken by them towards the establishment of cotton markets in the Presidency and trusts that the Local Government will continue their efforts in this direction by impressing upon local bodies in cotton centres the desirability of establishing regulated cotton markets wherever possible."

"The Indian Central Cotton Committee congratulates the Madras Government for enacting legislation for the establishment of markets in the Presidency for regulating the purchase and sale of commercial crops and trusts that the necessary steps will now be taken which will lead to the early establishment of regulated markets for cotton in all important cotton centres in the Presidency."

"That a Special Sub-Committee be appointed to discuss the question of a wider market for short-staple cottons, and that a representation be made to the Government of India to give the Indian Central Cotton Committee an opportunity of stating their views on the question during the course of the negotiations with Japan."

"The Indian Central Cotton Committee expresses its appreciation of the work of the Cotton Enquiry Committee in Lancashire especially the experiments now reported. It would be glad to see these experiments continued as proposed and extended in the manner suggested by the Technological Research Sub-Committee."

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE, CENTRAL INDIA.

Annual Report for the Year ending June 30th, 1933.

ADMINISTRATIVE AND GENERAL.

1. *General and Board of Governors' Meetings.*—A General Meeting of the Society was held at the Institute on February 27th, 1933, after which the representatives of the States present elected the Darbars of Dhar, Jaipur, Jodhpur and Rewa, each to provide a member of the Board of Governors for the ensuing three years.

The Board of Governors met on the following day, reviewed the past year's progress and the ensuing year's programme, and sanctioned various measures of expansion necessitated by increasing activities.

2. *Contributing Members of the Institute.*—It is satisfactory to record the decision of the Jodhpur Darbar to join the Institute for an initial period of five years. The Institute is glad to extend a welcome to this large and influential State, which offers much scope for agricultural development.

At the closing date of this report the following twenty States in Central India and Rajputana were members of the Institute, arranged in order of joining :—

Indore.	Dewas (Senior Branch).	Barwani.	Bundi.
Dhar.	Sitamau.	Jhalawar.	Partabgarh.
Jaora.	Narsingarh.	Bikaner.	Orchha.
Datia.	Tonk.	Rewa.	Bharatpur.
Rutlam.	Bijawar.	Jaipur.	Jodhpur.

Financial stringency, which causes hesitation over new expenditure, however desirable still prevents a number of other States from becoming members.

3. *Staff and Students.*—The post of Geneticist and Botanist sanctioned by the Board of Governors in February 1932 was widely advertised, but unfortunately the candidate who was first selected, for his comprehensive scientific attainments, was found to have submitted qualifications which he could not substantiate. After considerable delay, therefore, the post was offered to Mr. J. B. Hutchinson, M.A., Assistant Geneticist at the Empire Cotton Growing Corporation's Research Station, Trinidad. Mr. Hutchinson's specialization in the genetics of Asiatic cottons during the last eight years should render him a valuable acquisition to the Institute's staff, and will promote that expansion of the botanical side of research work, especially on cotton, which was contemplated when this post was sanctioned. This expansion has been necessarily hampered by the delay in making this appointment, and it is greatly to the credit of the existing staff, not only of the botanical, but of other sections, that so much of such work has been satisfactorily accomplished. The members of all sections have co-operated to achieve the end in view, and are to be congratulated on their spirit of collective enthusiasm.

The extended programme has necessitated the addition of several junior assistants to the staff and justifies the creation of eleven Research Studentships for graduates of Indian Universities, nine of which are already awarded. The Indian Central Cotton Committee has extended for a third year the period of its scholarship for research training in plant breeding and cytology, tenable at the Institute, and has increased the honorarium to Rs. 125 per mensem.

A Junior Farm Assistant was sent on deputation to Bharatpur, as Agricultural Officer for a year.

4. *Visitors.*—On December 8th the Institute was honoured by the visit of His Excellency the Viceroy and Lady Willingdon, who displayed keen interest, and were much impressed by all they saw. Their Excellencies afterwards presented signed portraits to the Institute.

The following visited the Institute during the year :—

Amarsingh, Kunwar, Director of Agriculture, Marwar Raj, Jodhpur.
Apte, V. G., M.A., Revenue Commissioner, Holkar State, Indore.
Arathoon, L., Manager, Bank of Indore, Indore State.
Atal, Amarnath Pandit, Rai Bahadur, M.A., Finance Member of Council, Jaipur State.
Bapna, S. M., Rai Bahadur, C.I.E., Prime Minister, Holkar State, Indore.
Bhagwat, M. M., Captain, A.D.C. to His Highness the Maharaja Holkar, Indore.
Bhargava, S. P., M.A., LL.B., Member, Special Committee, Foreign and Political Department, Government of India, Delhi.
Bhatnagar, Ayodhia Prasad, Municipal Executive Officer, Jaipur.
Bhopal Chandra Lodha, B.Com., P.W.D., Jodhpur State.
Bidwai, K. B., Sardar, B.A., B.L., Chief Minister, Dewas State (Senior Branch).
Brijendra Singh, Maharaj, Colonel, Rajgarh State, C. I.
Brijnathsingh Bahadur, Raja of Maihar State, C. I.
Corfield, C., I.C.S., Vice-President, State Council, Rewa.
Dabral, B. M., M.Sc., Cotton Physiologist, Sakrand, Sind.
Dafle, Bala Saheb, Major-General, Holkar State Forces, Indore.
Dave, C. N., B.Ag., Professor of Agriculture, Agricultural College, Poona.
Dave, Devishankar, Rao Bahadur, Dewan, Rutlam State.
Davies, P., Consulting Engineer to the Holkar State, Indore.
Dean, A. W. H., Executive Engineer, Central India Agency.
Deodhar, G. K., C.I.E., M.A., President, Servants of India Society, Poona.
Deshpande, Dr., M.Sc., Ph.D., Professor of Chemistry, Holkar College, Indore.
Deodhiwale, B. M., Major, Army Secretary, Holkar State, Indore.
Deolekar, M. V., Major, Private Secretary to His Highness the Maharaja of Dewas (Senior Branch).
Devisingh, Rao Bahadur, Thakur, Judicial Officer, Mhow.
Dhar, N. R., Doctor, Professor of Chemistry, Allahabad University.
Dhar Sheela, Mrs., Allahabad.
Dhoolsingh, Thakur of Phoolkhedi, Rajgarh State.
Durjansalsingh Bahadur, Raja, Rao Bahadur, of Khilchipur State.
Glancy, B. J., The Hon'ble, C.S.I., C.I.E., I.C.S., Agent to the Governor-General in Central India, The Residency, Indore.
Glancy, Mrs., The Residency, Indore.
Gokhale, V. G., M.Ag., Professor and Acting Principal, Agricultural College, Poona, with 60 students of the senior B.Ag. Class of the Poona College.
Gosalia, H. N., Dewan Bahadur, M.A., LL.B., Dewan and President, Council of Regency, Barwani State, C. I.
Hakim Singh, Sardar, Director, Amritsar Sugar Mills, Amritsar.
Kale, D., Dewas State (Senior Branch).
Kibe, M. V., Rao Bahadur, Sardar, M.A., Deputy Prime Minister, Holkar State, Indore.
Lakshmansingh, Thakur, Mohampura, Kushalgarh.
Maharaj Singh, Thakur, Amla, Kushalgarh.
Mheginlal, A., B.Ag., Lecturer, Poona Agricultural College, Poona.
Mir Aslam Beg, Revenue Member, Jaora State, C. I.
Mitchell, F. G., Indian Mildura Fruit Farms, Ltd., Okara, Punjab.
Pandit, G. B., Assistant Guardian to His Highness the Maharaja of Dhar.
Pawar, M., Dewas State (Senior Branch).
Raghunath Sahai, T., Revenue Member, Dhar State, C.I.
Rai Singh, Thakur, Chief of Bakhatgarh, Dhar State.
Ranjit Singh, Rao of Kushalgarh, Rajputana.
Reddi, Rama, P. H., M.A., B.Sc., I.A.S., Secretary, Indian Central Cotton Committee, Bombay.

Reshimwale, Gopal Rao, Sardar, Indore.
Sarupchandji Hukamchand, Sir, Rai Bahadur, Banker, Indore.
Sinndhe, W. B., Dewas State (Senior Branch).
Sarkanungo, Yadavrao, Thakur, Khargaon, Holkar State.
Sarfraz Ali Khan, Sahibzada, Khan Bahadur, Chief Secretary, Jaora, C. I.
Shaukatali, Syed, Khan Bahadur, B.A., Dewan, Rajgarh State, C. I.
Shindhe, W. B., Dewas State (Senior Branch).
Tambe, S. L., Rao Saheb, B.A., Revenue Commissioner, Holkar State, Indore.
Tilloo, K. B., Rao Saheb, B.A., Revenue Minister, Holkar State, Indore.
Tsolakidis, P., Messrs. Ralli Bros., Ltd., Indore.
Tyrrell, R., Captain, Punjab Regiment.
Vijayaraghavacharya, T., Dewan Bahadur, Sir, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, New Delhi.
Wills, C. U., C.I.E., I.C.S. (Retired), Special Officer, Jaipur State.
Yeshwantrao Bahadur, His Highness the Maharaja Holkar of Indore.
Zalim Singh, Thakur, B.Sc., Revenue Officer, Jhalawar State, Rajputana.

5. *Library.*—Numerous additions have been made to the Library during the year, and the number of books now totals 3,650. The binding of periodicals is almost up-to-date. The subject-indexing of the library is still in progress, and has been extended to the very large number (3,500) of bulletins and pamphlets. A growing feature has been the number of loans made to other research workers in India. The number of books sold was 106.

Research Work.

6. *Organization.*—Without countenancing the danger of making water-tight compartments, it has been found that the Institute's programme falls naturally under two main heads or sections, namely, Botany and Genetics, and Chemistry and Agronomy. No hard and fast line, however, is drawn between these two sections, and all members of the staff are encouraged to become familiar with the work outside their own sphere, while co-operation between the executive farm staff and the research staff renders the former also largely research workers.

During the year many new subjects of research have been started; it has been necessary to enlarge the chemical laboratory by compressing the administrative offices, and a good deal of new apparatus has been purchased and ordered. Some new buildings have been erected, namely, a drying room, store, petrol-gas-plant house, and a working verandah.

No less than 115 replicated field experiments were laid down during the year, 82 at the Institute farm, and 33 in eight different States. These large numbers necessitated standardization and systematization of the work, which has been unexpectedly successful, bearing in mind that it has been carried out by staff largely inexperienced in this type of work. A paper, describing the methods employed, has been published.*

It is fitting to acknowledge here the willing co-operation both of the Darbars, and of the officers and voluntary workers concerned, of the various States who undertook to carry out these field experiments, namely, Indore, Dhar, Datia, Rutlam, Narsingarh, Bikaner, Jaipur and Bharatpur. Valuable results have been achieved, and little or none of this important work could have been done without their willing co-operation. This is the first year in which experiments of this kind have been made in the States, and the results are most encouraging.

Acknowledgment is also due to the Provincial Agricultural Departments, notably those of Bombay, the United Provinces, the Central Provinces and the Punjab, for much assistance and co-operation willingly rendered; also to Agricultural Departments in the U.S.A., Canada, Australia, South Africa, Uganda, Nyasaland and Morocco.

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* See para. 26.

7. *Weather and its effect on crops.*—As in 1932 the monsoon rainfall on much of the Malwa Plateau was excessively continuous and all *kharif* crops suffered severely. At Indore, the rains began on June 24th, three inches fell up to the 28th—barely enough for sowing. On July 2nd showers began again and from then up to August 19th—48 days—there were only six rainless days, scattered singly over the period, in which 27 inches fell. Ten inches were then recorded in early September and scattered but heavy showers succeeded up to October 17th. The total rainfall from May to October was 46·5 inches.

The effect on *kharif* cropping was disastrous. Much land was never even sown and such crops as survived were poor and stunted.

Fortunately not all parts of Central India were so badly treated and towards and in many parts of Rajputana crops were normal. East Central India suffered from shortness of late monsoon rains.

Cold weather rains were absent or very deficient in Central India and *rabi* crops were light.

8. *Cotton.—(i) Botanical and Genetical.*—The improvement of cotton varieties for different tracts in the area served by the Institute is perhaps the most important work in hand in this section. The three main tracts are the Malwa Plateau, Rajputana, and the Nimar tract of Central India adjacent to Khandesh and the Central Provinces.

(a) The creation of a superior strain of barani (rain-fed) Malvensis cotton for the Malwa Plateau, has been in progress since 1925, and is now almost achieved. The field has been narrowed to five types; these were tested in two replicated, randomised-block field experiments at Indore in 1932, on medium and on poor land. The best-yielding type, No. 9, gave 38 per cent. more *kapas* to the acre on medium land, and 31 per cent. more on poor land than either *bazaar* seed or mass-purified Institute farm seed. Another type approached this increased yield very closely. The lint length of these two types averages respectively 21 and 23 millimetres, and ginning percentages 29 and 33. These figures are all statistically very significant, the standard of error percentage of the yields being 5·3 on medium land, and 4·7 on poor land. Similar experiments were also carried out at Dhar, where rain-erosion vitiated the results, at Rutlam, where an error made it impossible to treat the yields statistically, and at Narsingarh, where all the Malvi strains gave yields equal to the local mixture.

Ball's Purity Checker Target method gives vivid indications of the uniformity of halo-length, of ginning percentage and of yield per plant, in progenies of the pure-line selections mentioned of the 1932 crop. The uniformity of these characters was also estimated statistically. The best-yielding type, No. 9, possessed the greatest uniformity in all these respects, which finding has been consistently confirmed in variety trials in different environments.

Ten similar replicated field trials have again been laid down in 1933 at Indore, both at the Institute and on cultivators' land, and on State land at Dhar, Ratlam, Narsingarh, Sitamau, Jhalawar and Partabgarh. In addition 54 single plots of 1/100 acre have been grouped in villages near these experiments, on land of the same revenue classification. Twelve of these single plots are also being sown in Jaora State. It is therefore hoped that by the end of the 1933 season sufficient yield-data will have been accumulated to warrant the final choice of one among the five selected types.

In the meantime all available seed of each type is being propagated to the utmost possible extent in fields isolated from other cotton. In order to obtain the greatest yield of seed per plant, the seed is being sown very thinly at the rate of about 3 lbs. per acre by special drills, with wide-spaced rows. In total thirty-three acres are being thus propagated. The types are being maintained pure from year to year by selfing the original stocks, so that a reliable pure nucleus will always be available for renewing propagation seed.

In addition further single-plant selections of Malvi cotton and of the progenies of several crosses between Bani, Malvi and Roseum types have been made.

Spinning tests were conducted at the Indian Central Cotton Committee's Technological Laboratory at Matunga, Bombay, with the lint produced at Indore from the 1931 crop of five Malvi cotton selections. The following table gives the more important data :—

Malvi Cotton Tests, 1931-32, *at Matunga.*

Types.	Mean fibre length in inches.	Mean fibre weight per inch.		Waste percentages.		No. of breakages in the ring frame per 100 spindles per hour.	No. of neps per yard.	Nominal counts.	Highest standard warp counts.
		1st picking.	Subsequent pickings.	Blow-room losses.	Card-room losses.				
Malvi Type 1	7/8″	0.215	0.216	6.2	9.4	14	1	6	
						3	1	8	10's
,, ,, 3	15/16″	0.189	0.211	5.9	10.1	0	1	8	
						9	1.2	10	13's
,, ,, 5	29/32″	0.199	0.196	6.6	8.6	18	1.2	10	
						67	1	14	11's
,, ,, 8	25/32″	0.256	0.231	5.9	9.3	27	0.8	6	
						110	1.2	8	7's
,, ,, 9	13/16″	0.213	0.204	4.9	7.6	15	1.5	12	
						42	0.8	14	
						55	0.8	16	13½'s
Farm bulk ..	13/16″		0.182	6.2	8.6	27	2.0	10	
						44	2.0	12	
						79	1.8	14	12's

(*b*) *Influence of self-fertilization on vigour.*—It is sometimes believed that continuous "selfing" of a pure line leads to reduced vigour. The validity of this belief was tested by comparing the yields of four pure strains sown separately, with a crop grown from seed derived from a plot sown with a mixture of the same four strains, the plants being allowed to intercross. There was no significant indication of superior vigour or higher yield resulting from the unselfed seed, but a further test is arranged. Possibly this result may be due to all strains being indigenous to Malwa.

(*c*) *Cotton for irrigated and manured land in Malwa.*—The need for a variety of cotton which will respond to manuring and irrigation in Malwa was realized from the beginning, and selections of Cambodia cotton have been in existence for some time. For the first time these selections, with a few other American types, were compared in 1932 at Indore, Dhar, Ratlam, Narsingarh and at Jaipur, with somewhat different results, according to soil and climate. Extremely healthy, high-yielding crops of Cambodia can be grown at

Jaipur, and the Indore Selection No. 1 has been strikingly successful there. At Indore and Jaipur a Malvi strain was included, and the effects of irrigated pre-monsoon sowing were compared with rain-sown crops, irrigated and *barani*. At each centre there was a surprising result. Not only did all successful types yield about twice as heavily by virtue of being sown as little as fourteen days before the advent of the monsoon, but it was found that the Malvi strain actually yielded, under these conditions, more heavily than the Americans.* These results support the supposition that Malvi cotton responds poorly to post-monsoon irrigation, but yields of 22 maunds of *kapas* per acre from pre-monsoon-sown Malvi cotton demand study of the reasons for such a phenomenal increase. A series of experiments have been sown in 1933, and if these unexpected results are confirmed, it would appear that where pre-monsoon sowing is possible Malvi cotton is superior to Cambodia in yield.

(*d*) *In Rajputana work on cotton* in the *Gang Canal Colony* of Bikaner State has made good progress under the special scheme financed by the Indian Central Cotton Committee, the scientific control of which is entrusted to the Institute. The first object in this newly-irrigated tract is *to find the most profitable of existing varieties* and then to make improvement by further selection or breeding. In 1932 eight well-known varieties were grown in replicated yield trials and another twelve in observation plots. Cawnpore 520 and *Mollisoni* were the leading varieties; the Punjab-Americans seem unable to give comparable return in the severe climatic conditions of this area. Selection work among *Mollisoni* types has begun.

Agronomic problems were also studied in a series of replicated experiments. It would seem that the usual *date for sowing cotton* in the Colony—April—could be postponed till May with general advantage and less risk of loss in years of short supply of canal water in April. When this short supply is prolonged sowings may even be made in July with a chance of a moderate crop.

The irrigation requirements of *Mollisoni and Punjab* 289*F* were subjected to test. *Mollisoni* gave similar yields on a range of four to eleven waterings in the season, while in Punjab 289F the yield rose markedly when four and seven waterings (yields identical) were increased to eleven and thirteen. The later-ripening habit of this variety also causes response to late irrigations.

The influence of leguminous green-manure crops (both cut for fodder and ploughed in) was compared with that of compost in an experiment designed to last several years. The first subsequent crop (*toria*) yielded best on fallow and after compost and it appears that it is mainly the stubble and roots of the green-manure crops which are responsible for depressing the yield of the following crop. All plots are now under cotton. For 1933 the above experiments are repeated with modifications. All the results, of course, require confirmation.

Among other work on cotton in Rajputana that done at Jaipur has been already mentioned. In 1933 a comprehensive series of replicated experiments and single plots has been arranged in the following States: Jhalawar, Jaipur, Bundi, Partabgarh, Bharatpur and Jodhpur. These experiments cover both irrigated and *barani* conditions.

(*e*) *In the Nimar Tract of Central India* three replicated experiments were carried out, to compare the merits of a local (largely *Roseum*) cotton with Banilla, *Verum* 262, and a pure *Roseum* type from the Central Provinces. There are strong indications that Banilla was the most profitable of these varieties. Further replicated experiments have been arranged at four centres in Dhar and Indore States, as well as a number of small single plots in conjunction.

(*f*) *The botanical survey of cottons grown in India* had been extended by the acquisition of a large number of additional varieties, the characteristics of which were recorded in full detail including those of the root-systems of most of them.

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* Irrigation given to Malvi cotton in autumn did not increase yield.

(*g*) *The effects of X-radiation of cotton seed, buds and pollen* upon subsequent generations was further studied, and many exposures of material were made by the courtesy of the Maharaja Tukoji Rao State Hospital at Indore, where also radium emanations were applied. Unexpectedly, no aberrant types resulted from exposures of seed, although the intensities and durations were equivalent to those given by other workers to other cottons, in which deviations from type occurred. Both Indian and American cotton seed was treated, but with no difference in the result. A large quantity of seed produced by irradiated pollen and buds is available for use in 1933.

(*h*) As a preliminary to the *cytological study of irradiated cotton* the Indian Central Cotton Committee scholar has attempted, with material success, to trace the normal development of the megaspore and female gametophyte in an Asiatic cotton (*G. neg. ver. Malvensis*-Gammie). He has been so fortunate as to obtain sections which show fairly clearly the mother-cell at the process of division and has also noted certain apparent abnormalities calling for further study. The effects of X-rays on somatic chromosomes in the cotton root-hair have also been observed and irregularities found in mitosis. A fairly frequent malformation, so far observed only in crops of Indian cottons, namely the production of masses of miniature leaves and buds which never develop, has been found to be associated with bi-nucleate pollen grains. It is being examined further.

(*j*) Material for the study of the *genetical relation between lint-length* and the factors responsible for *ginning percentage* has been accumulated in the F^2 generation of a cross between a short-staple, high ginning, Roseum and a long-staple, low-ginning Bani cotton.

(*ii*) *Cotton Physiology and Agronomy.*—The relationship and reaction of the cotton plant to its environment :—

(*a*) *Leaf-roll and Red-leaf of American cottons.*—The pH of healthy and diseased mature leaves was determined throughout the season and previous findings were confirmed. Moisture determination, proximate and ultimate, and analysis of diseased and healthy leaves collected during the season at Indore, Dhar (Badnawar) and Jaipur is in progress. Root-studies were made at these centres and samples of plants and associated soils have also been collected.

Lysimeter studies with Dhar (*adhan** land), Jaipur and Indore soil-profiles have been started for comparative observations on Malvi and Cambodia cotton plants in these soils under climatic conditions at Indore.

Pot cultures, in the open and protected from rains, with dressings of farm compost, municipal compost, safflower cake, charcoal and brick powder were made. Factors other than rain spatter alone appear to play a part in the development of red-leaf and leaf-roll. Increased evaporation of moisture from soil and greater transpiration by the plant seem to be two of them.

Osmotic pressure of diseased and healthy leaves were studied during the season, and diseased leaves were found to have a definitely lower osmotic pressure than healthy ones. A study of the osmotic pressure of the corresponding soil solution by the freezing point method is in progress. A paper on the above and allied problems has been written.†

(*b*) *Cotton Wilt.*—At the request of the Indian Central Cotton Committee, research on this disease, which up till recently had been the subject of a special investigation at Dharwar, was started at the Institute. Wilt, however, is not commonly regarded as a serious disease in Malwa, and the conditions of its epidemic incidence will be simultaneously studied in the Nimar tract. Observations on the extent of wilt on the Institute land were taken and samples of diseased and healthy plants and corresponding soils up to three feet depth were collected for examination. The presence of the wilt fungus was established in affected stems.

(*c*) *Nitrification in black soils.*—Nitrification of safflower cake, ammonium sulphate and farm compost in black soil, with high and low humidity, and at monsoon temperatures was studied, and a paper written which awaits publication.†

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* Irrigated and manured for many years.

† See para. 26.

Another experiment is in progress on the nitrification of the same manures in black soil, dry and moist, sterilised and unsterilised, under summer conditions, and in direct sunlight and under shade.

(*d*) *Soil studies.*—Surface and sub-soil samples from different regions and Rajputana have been received and are being studied in Central India.

Movement of moisture in different fields at the Institute was studied during the crop-period. The pencil-point method was also employed in addition to the usual one, to determine its applicability to such studies at Indore. Patches in Institute fields with very poor average and very rich crop growth were marked out, the height of crops measured, and surface and sub-soil samples from these patches were collected at the end of the *rabi** season for study on soil-salinity. Further work will be continued this year.

(*e*) *Reaction of the normal leaf sap* of the main local crops was determined throughout the season. The crops studied were cotton (*desi* and American), wheat, *jowar*, maize, suga-cane, lucerne, linseed, gram and *tur*.

(*f*) *Composting of farm refuse.*—Successful experiments aiming at simplification and economy of water and labour in the standard Indore process were made in all the three seasons, and included reduced watering and turning, dispensing with dung, and composting straw, sugar-cane trash or mixed refuse only. Quantitative experiments were made to study the relation between nitrogen conservation and output, in compost made by rain-watering only. A product with up to 1 per cent. of total nitrogen was obtained with a total rainfall of 47 inches. The possibility of nitrogen-fixation in compost heaps under controlled conditions was studied. There are positive indications of such a fixation and further work is in progress.

Composting in heaps above ground with artificial watering, was done in the hot season to study its suitability for large irrigated estates where pits are inconvenient. The usual type of manure was obtained at the end of three months, but the quantity produced was rather less, and more water was required than in the standard process. Another experiment is in progress to adjust compost-making to canal areas where the flow of water is periodic. A leaflet† has been prepared describing a rain-watered modification of compost making which is much simpler than the standard process and involves a minimum of labour.

A great deal of interest has been aroused, both in India and other countries, by the success of the Indore compost system. It has been adopted as standard practice on the farms of the United Provinces Department of Agriculture, for which a special cinematograph film has been prepared by a member of the Board of Governors of the Institute, three large land cultivation companies have also adopted it, and it is in regular operation in a number of States. In Nyasaland the process is being adapted to local conditions.

A criticism which has been advanced with some justification against the original standard process is that to the average cultivator it seems complicated and troublesome. This difficulty undoubtedly exists, but the complication is more apparent than real. It is hoped, however, that the extremely simple rain-watered modification referred to will remove this difficulty and will result in its widespread use among the cultivating classes. This cannot fail to be of great benefit, not only to themselves, but to the country at large. The paramount importance of this development is obvious when the plain fact is realized that by it at least thirty cart-loads of manure can be prepared per pair of bullocks on a holding, whereas with the ordinary cultivator's system, or rather lack of it, about twelve loads is considered good practice. This system, if widely adopted, would go far to supply the admitted imperative need of Indian soils for more organic manure.

(*g*) *Disintegration of bones.*—Bones were found to char readily in heaps with moderate quantities of cotton stalks as fuel; there was scarcely any loss of phosphorus, and the

* The cold-weather season. † See para. 26.

treated bones could easily be ground in a village mortar mill. About half the nitrogen was lost. The best method of utilizing this source of phosphorus is being studied.*

(*h*) *Erosion of black cotton soil.*—The results at the Institute of land-grading with open drains as a means of preventing erosion in black soils have been reviewed in a paper† and suggestions made for further developments which are being tested. This problem is of extreme importance, particularly in black soil areas, and its solution would prevent a largely unnoticed loss of many lakhs of rupees.

(*j*) *Control of White Ants in field crops.*—A poisoned bait has been prepared which gave good results in the laboratory and is undergoing tests on a field-scale. The bait is impregnated with poison in a form which cannot easily be washed out in the soil.

The following Field Experiments on Cotton Agronomy were carried out :—

(*k*) Elaborate *manurial trials on Malvi cotton* were laid down but unfortunately almost all plants were destroyed by heavy rains and surface wash.

(*l*) *Spacing of Malvi cottons.*—Taking 14 × 4 inches as normal-practice spacing, it is found that yields are identical if the number of plants per acre are reduced by 30 per cent. At 50 per cent. there is a lower yield per acre. Vegetative growth is best at 17 × 8 inches. At this spacing there are 25 per cent. more plants per acre than with 21 × 8 inches, which, however, gives the same yield, showing that the yield figure per plant was here higher than in 17 × 8 inches though the vegetative growth was poorer. The effects on the distribution of upper and lower roots at different spacings were recorded.

(*m*) "*Topping*" *of Malvi cotton.*—Two preliminary tests (replicated) were sown and indicated a tendency for "topped" plants to give increased yield.

A detailed experiment has been sown in 1933 to discover the most suitable time and method and the reason for increased yield.

(*n*) The results of an experiment on the influence of *date of sowing* and of *irrigation* on yields of *American and Malvi cottons* indicate the possibility of increases in yield by agronomical adjustment (*vide* para (*c*), p. 86).

(*o*) The effects of different *methods of interculture*, including weeding alone, were tested on a cotton crop, but no significant differences were found. Possibly this is due to the peculiar nature of the season and a similar experiment is laid down in 1933.

(*p*) *The rotation experiment* was redesigned, following realization of certain drawbacks in the original lay-out. The first results can therefore be expected by 1936. The influence on cotton of the preceding crop is also being examined by a separate experiment of two years' duration, starting in 1933.

(*q*) *Soil-uniformity test.*—This was laid down to determine, under local conditions, the normal error for field experiments, using different sizes and shapes of plots, and different numbers of replications and arrangements of randomized blocks. The validity of random sampling methods by rows and strips is also to be studied. The examination of the very large mass of data is not yet complete. The 1932 test was on *jowar* cut for silage (other crops having been destroyed by continued rain); in 1933 an amplified test has been laid out for cotton.

9. *Sugar-cane and Sugar-beet.*—Variety trials of well-known Coimbatore and other canes were laid down at Indore (Malwa and Nimar), Dhar, Datia, Rutlam, Narsingarh, Bikaner and Bharatpur.

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* Work on similar lines has been done during the past year by the Bombay Department of Agriculture.

† See para 26.

Eighteen types new to Indore were brought from Coimbatore and elsewhere for initial trial. These included a series of the *jowar*-sugarcane crosses evolved at Coimbatore. Agronomic work includes experiments on dates of planting, preservation of seed-cane, manuring and systems of cultivation. It has been found possible to recover sugar from *gur* equal in quality to that obtained from *rab* by the open pan (Hadi's) process. Further study is required on the influence of *gur* quality on sugar-recovery and the economics of the process.

Sugar-beet has been grown successfully on small areas at Indore, yields and sugar percentage being similar to those of Europe.

10. *Tobacco.*—Work on this crop started for the first time in 1932 ; initial experiments were made on dates of planting and irrigation requirements, while eleven local and imported types were tested. A simple process for curing cigarette tobacco without the use of flue-barns has been evolved, and bright leaf of good quality obtained. Seed of a large number of foreign varieties has been imported for trial this year.

11. *Wheat.*—Replicated trials of a number of standard varieties were tested under *barani* and irrigated conditions against local types at Indore and in Dhar, Jaipur, Datia, Narsingarh and Bikaner. Several types showed superiority over the local ones, but further tests and consideration of quality and market prices are required.

Over 150 types are now under test on a small scale at Indore. Search is being made for a *durum* variety, both for irrigated and *barani* conditions, equal to or better in quality than the local Malvi type, and a better yielder. Replicated experiments on manuring, spacing, and pre-sowing were carried out, but the results await statistical treatment.

12. *Gram.*—Similar variety trials were made at Indore, Dhar, Datia, Narsingarh, and Bikaner, and a few promising varieties will be carried forward for further test. Fourteen types are being examined in line tests at Indore.

13. *Linseed.*—Sixteen types, including selections from the local crops, were tested at Indore in lines. Good yielders of high oil-content will be tested more thoroughly.

14. *Barley.*—Replicated trials of well-known varieties were made at Bikaner and Jaipur.

Eighteen types, including many exotics, were under test at Indore.

15. *Jowar.*—Four varieties were tested against the local Malvi type in replicated plots. "Saoner" gave the heaviest yield of grain. Selection of types among Malvi local is in progress.

16. *Lucerne.*—Field trials were made to compare varieties, manuring, methods of cultivation and the effects of inoculation with root-nodule bacteria, and of cutting at different stages. The results so far available are valuable and significant, and the experiments will be, of course, continued.

17. *Groundnuts.*—Variety trials were sown at Indore and Jaipur, and five new types which are distinctly promising were received from America. The efficacy of sowing whole or cracked nuts and kernels was tested and no significant difference in yield was found, but this requires confirmation. The effect of giving manure to two varieties in rich and poor soils was tested but little response was found. Further trials, varietal and agronomical, are laid down in 1933.

18. *Soya beans.*—Further attempts were made to find a variety suitable to Central India and Rajputana. Thirty varieties of Manchurian and Chinese origin and of different growth habits were tested.

19. *Rice.*—It has been found possible to grow rice successfully in waterlogged fields on the black soil in Malwa. Such areas seldom carry any *kharif** crop, but an early-maturing variety of rice makes this possible without sacrificing the usual *rabi* crop. A number of varieties are also under test at Rewa and Orchha.

20. *Other crops.*—Single trial plots of different varieties of *tur*, maize, millets, oats, *patwa*, sesamum, castor, pulses, potatoes, and clovers continued under trial at Indore and in other States.

21. The effect of *leguminous catch-crops* and *green-manure crops* taken in the *kharif* season before wheat was tested in a replicated experiment. It was found that cowpea was the most promising legume tried, and that a crop cut green not only supplied valuable fodder which could be made into hay or silage, but the succeeding wheat crop yield was distinctly higher than that after the fallow plots.

The root-systems of a number of such leguminous crops were exposed and drawn to scale.

22. *Different arrangements of inter-cropping jowar with tur* were compared in replicated trials at Indore, and a similar experiment was made at Jaipur with *bajra* and *tur*. The results show that the interpolation of *tur* in a *jowar* crop is more profitable than *jowar* alone. The best proportion is under investigation.

23. *Sudan grass.*—This perennial fodder crop gives indications of being a valuable introduction to Malwa and Rajputana. The best means of utilizing it are being studied.

24. *Silage.*—A simple and cheap method has been developed for making silage above ground in tower silos built of mud, thus enabling grass to be cut and ensilaged during the rains, when pit silos are frequently waterlogged.

25. *Municipal compost.*—The adaptation of the Indore farm compost process to the sanitary disposal of habitation wastes was further developed and the technique perfected. The process is being vigorously followed at the disposal grounds of the Indore City and Residency and the Malwa Bhil Corps, and in each case a previous loss has been converted into a handsome profit, the manure having a brisk sale. In seven other States and in the Neemuch Military Cantonment a commencement has been made. The Municipal authorities and Health Officers are entirely satisfied and steps are being taken to introduce the process in villages. The analysis of the product averages about 1 per cent. nitrogen, 2·5 per cent. phosphate and 2·5 per cent. potash. Its content of phosphate renders it a cheap substitute for oilcakes and other such manures, and being an organic manure, its influence in maintaining soil-texture is of great value.

26. *Publications.*—During the year two papers were published in *Agriculture and Livestock in India* : —

"The Design and Conduct of Field Experiments." By F. K. Jackson and Y. D. Wad.

"A Note on Erosion in Black Cotton Soils." By Y. D. Wad and G. C. Tambe.

The above and the following two papers were read at the January 1933 Session of the Indian Science Congress at Patna :—

"Nitrogen Balance in Black Cotton Soils in the Malwa Plateau." By Y. D. Wad and V. G. Panse.

"Some Factors influencing the Cotton Crop in Malwa." By Y. D. Wad and V. G. Panse.

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* A crop sown on the advent of the rainy season.

An additional Leaflet (No. 2) on the rain-watered modification of the Indore Compost Process was issued. Others are in preparation on Silage and on *Gur*-boiling, using the improved McGlashan furnace.

A note on the use of celluloid tissue for covering mounted herbarium specimens was published in *Nature*.

PROPAGANDA AND EXTENSION WORK IN STATES.

27. *Visits to States.*—During the year under report touring by the Agricultural Adviser was restricted to twenty-four visits to States. This reduced number was the result of pressure of duties at Indore, largely brought about by the delay in appointing the Geneticist and Botanist, the general programme of work having been increased in anticipation of this officer's early recruitment.

The Extension Officer, however, paid thirty-four visits and other members of the staff nine, so that adequate contact was maintained between the Institute and its member-States.

28. *Instructional and training facilities.*—Full advantage was taken of these facilities, fifteen agricultural officers and students from nine States having received practical training in general agriculture. Specialized instruction was given in *gur*-boiling and farm compost-making, both at the Institute and in a number of States, to whom instructors were sent for varying periods.

In conjunction with the Indore City and Residency Area Municipal authorities, officials and staffs from seven States, from the Neemuch Military Cantonment and the Malwa Bhil Corps were trained in the new method of making compost from habitation wastes.

Assistance was given by the Extension Officer and other staff in organizing Agricultural Shows and Cattle Fairs in five States: Indore, Datia, Jhalawar, Orchha and Bharatpur. Exhibits illustrating the advantages of pure seeds and improved methods were shown and demonstrations of simple implements, e.g., the *Kans* plough and two-row drill, of compost-making and of silage-making both with *jowar* and grass. Cinematograph films of agricultural subjects were also shown, the films being provided free of charge by the Indian Central Cotton Committee and the Central Railway Publicity Board.

Sales of implements and seeds again declined owing to the acute agricultura depression.

29. *Special services.*—The Jaipur City Sewage Farm has worked successfully, following the recommendations laid down last year. Numerous inquiries on a variety of subjects were dealt with; the exploitation of bat guano for manure, of forest grasses for paper and straw-board making, the improvement of herbage and the utilization of machinery on grass farms are examples.

Schemes for the working of State Demonstration Farms were drawn up, a farm was laid out and many field experiments were designed to solve local problems. Advice was given to several capitalists desirous of embarking upon agricultural projects and, in at least one case, failure was thereby averted.

It is encouraging that so many States have made increasing and good use of the facilities afforded by the Institute and the fact that the Extension Officer's time has been fully occupied on States' work is proof of the need for the creation of his post.

30. A year of progress and of expanding activities on all sides is recorded. Reorganization and training of staff in new methods has been necessary, new equipment and apparatus has been and is being installed, and a good deal of the year's new work has been of the nature of tilling the ground and planting the orchard. The fruit of this new work, in the shape of further concrete results of value to the cultivator, can be expected with confidence in the future.

F. K. JACKSON,
Director.

Staff and Research Students of the Institute of Plant Industry on June 30th, 1933.

Administrative and Clerical :—

Director and Agricultural Adviser to States in Central India and Rajputana	F. Keith Jackson, N.D.A. (Hons.), Dip. Ag. (Cantab.).
Personal Assistant	A. N. Srivastava, M.Sc.
Stenographer	I. Tucker.
Head Clerk and Accountant ..	G. M. Nadkerni.
2nd Clerk	Har Prasad.
3rd Clerk	D. D. Smith.
Artist	S. R. Srinivasan Ayyer.
Assistant Artist	S. Joseph.
Librarian	Bashirhusain Khan.
Experiment Records Clerk ..	S. A. Khargonekar.

Botanical :—

Geneticist and Botanist	J. B. Hutchinson, M.A. (designate).
Senior Botanical Assistant ..	Vacant.
Plant Breeding Assistant ..	Kuber Singh, B.Ag.
Botanical Assistant	R. L. M. Ghose, M.Sc.
Fieldman	E. L. Rajanna.
Research Student	Bhola Nath, M.Sc.*
,, ,, ...	T. V. Mulye, B.Ag.†
,, ,, ...	Two Vacancies.†

Chemistry and Agronomy :—

Chemist and Agronomist ..	Y. D. Wad, M.A., M.Sc., A.I.I.Sc.
Chemical Assistant	V. G. Panse, B.Sc.
Laboratory Assistant	S. S. Chiney, B.Sc.
,, ,, ...	L. N. Desai, B.Sc.
,, ,, ...	G. T. Shahane.
,, ,, ...	V. S. Dravid.
Research Student	Chironji Lal Nagar, B.Sc.†
,, ,, ...	V. N. Bhargave, B.Sc.†
,, ,, ...	R. K. Aurangabadkar, M.Sc.†
,, ,, ...	S. B. Mogre, M.Sc.†
,, ,, ...	K. N. Ambegaokar, M.Sc.‡
,, ,, ...	S. C. Chakravarty, M.Sc. (designate).†
,, ,, ...	T. Krishnamoorthy, B.Sc. (designate).†
,, ,, ...	I. Madhusudana Rao, B.A. (Hons.) (designate).†

Propaganda and Extension Work :—

Extension Officer	M. L. Saksena, L.Ag., F.I.C.S.

Farm Executive :—

Farm Superintendent	G. C. Tambe, B.Ag.
Assistant Farm Superintendent ..	S. C. Talesara, B.Ag.
Junior Farm Assistant	G. G. Phadke, L.Ag.
,, ,, ,, ...	K. M. Simlote, B.Ag.
Fieldman	V. R. Sathe.
,, ...	Nihal Singh.
Storekeeper	Ishri Prasad.

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* Indian Central Cotton Committee Research Scholarship.
† Institute of Plant Industry Research Studentship.
‡ Voluntary research worker.

INSTITUTE OF PLANT INDUSTRY, INDORE, CENTRAL INDIA.

Year 1933-34.

Cotton Research Programme.

1. *Botanical Survey of Indian Cottons.*

Completion of records of morphology, etc. Enquiry whether morphology alters with locality.

2. *Genetics.*

Continuation of search for mutations in X-rayed and radium-exposed cottons.

Study of genetical relation between lint length and factors controlling ginning percentage and yield.

Inheritance of " No-lint " and Wagale cotton features.

3. *Cytology.*

Study of normal course of events in ovule fertilization in Indian cottons; comparison with irradiated material.

Effect of environment on cotton-lint characters.

4. *Selection and breeding.*

Single-plant selections to be continued in Malvi and Cambodia types, and in Bani, Roseum, Verum, some Cawnpore crosses and those made at Indore in 1930.

Accurate yield trials of the five most promising Malvi types already selected—in confirmation of trials made in 1932. Ten replicated experiments are laid down in different parts of Malwa in preparation for seed-distribution.

5. *Variety trials.*

Nimar tracts—confirmation of variety trials between Banilla, Verum 262, Roseum and Malvi cottons in four centres.

Rajputana tracts—replicated trials of appropriate varieties, *barani* and irrigated in Jaipur, Bikaner, Bharatpur and Jodhpur.

6. *Physiology.*

Nutrition—influence of different ratios of organic and inorganic forms of nitrogen potash, phosphate and of calcium and iron; of soil-moisture at different stages of growth; of legumes grown before, or together with cotton and of the influence of other crops previous to cotton. These studies will involve some ten or twelve replicated plot experiments at Indore. Vigour, disease-resistance and yield in relation to the above factors; the influence of well-ripened seed on the crop, and the influence of environment on the vitality of seed and its relation, if any, to chemical composition.

Soil salinity in relation to yield and vigour ; remedial measures.

The nutrition of the cotton boll while ripening.

Study of nitrification in surface black soils and sandy soils as influenced by climatic factors and cultural conditions.

Changes in *replaceable bases* in soil during crop-periods, their effect on plants as regards growth and disease.

Heating of black soils—changes in texture and replaceable bases and their possible influence on crops.

Effects of *environment* upon *root-systems.*

Study of the normal absorption of nutrients by Malvi and Cambodia cottons at different stages of growth and in different soils.

Nutrition deficiencies in relation to growth and ripening of cotton and to disease-susceptibility and lodging.

Effect of continuous treatments on the organic matter, base-exchange, texture and cropping power of black soil.

The cause of *flocculation of soils* by *safflower-cake* extracts with a view to finding an alternative.

Soil-oxygen in relation to Cambodia cotton.

Physiological factors in growth, disease and ripening of cotton, the influence of moisture and its indirect effect on soil-profile.

Review of manurial experiments in India.

7. *Agronomy.*

Malvi and Cambodia cottons, responses to irrigation and pre-monsoon sowing.

Malvi cotton-spacing—in five types of rotation—with different modes of pre-cultivation and inter-culture.

8. *Cotton Wilt research.*

Collection both at Indore and in Nimar of wilted plants both dead and surviving, and of healthy plants.

Examination of root-systems and associated soil-profiles of such plants.

Analysis of collected plants.

Isolation of the fungus from local plants ; importation of strains from other places.

In cultures of the fungus, to determine the influence of such nutritional changes as are expected to occur in nature, upon the organism and its parasitic capacity.

The relationship between plant metabolism and the activity of the fungus as indicated by the composition of plant sap.

The influence of soil-profile conditions in pot cultures upon the activity of the plant and the organism.

GENERAL AGRICULTURAL RESEARCH PROGRAMME.

1. *Crop problems.*

Jowar and Tur replicated trial to discover optimum spacings.

Fodder studies :

Economic survey of natural fodder herbage in Malwa. Supply of cultivated green succulent fodder without displacing cash—or food-crops.
Silage.

Sugar-cane—modifications in cultivation, manuring and irrigation to cheapen production in well-irrigated areas.

Sugar beet—agricultural and economic possibilities.

Lucerne—manuring, systems of cultivation, economy of water, inoculation.

Wheat—manuring, green manuring, spacing, effects of soil and air temperature.

Tobacco—improvements in cultivation (*barani* and irrigated) and in curing, with special attention to cigarette leaf.

Sunn hemp—retting.

2. *Variety trials.*

Replicated trials of varieties and types of Jowar, Tur, Groundnut, Sugar-cane, Wheat, Lucerne, Tobacco, Linseed and Gram at Indore, repeated in appropriate centres in Central India and Rajputana with additions of other crops (e.g., barley) where necessary.

Initial small-growth tests lines or single plots of crops and varieties new to the areas concerned, such as soya bean, oats, exotic legume fodders, safflower.

3. *Agronomical.*

Control of soil erosion.

Rotation experiments.

Modes of pre-cultivation and inter-culture.

Compost studies—rain-watered heaps for low rainfalls—in canal areas—single materials, e.g., cane trash.

4. *Field Experiment technique.*

Collection of data for further simplification—for different localities and crops—to reduce labour and skill by substituting plot samples for complete plots, and field-wide strips for special plots.

APPENDIX III.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546	611,606	565,084
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257	348,009
Bombay Presidency	1,180,410	1,424.447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,132,645	1,116,297
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707	292,013
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820	273,115
Central Provinces and Berar ..	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018	111,208
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390	103,784
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681	80,452
Rest of British India	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342	31,935
Total—British India ..	1,693.438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,987,603	2,008,804
Total—Indian States ..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793	351,260
Total—India ..	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,346,396	2,360,064

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

——	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488
Mysore	43,571	44,320	39,619	46,590	43,326	49,293	50,596
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,036
Kathiawar States ..	46,809	52,581	57,224	64,454	20,283	18,849	18,868
Other Indian States ..					32,558	39,382	40,209
Pondicherry					18,350	20,257	23,170
Total ..	229,443	251,589	277,540	315,399	333,996	358,793	351,260

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

——	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
Bombay	28,328	24,970	27,324	24,361	54,409	74,979	80,092
Madras	35,198	39,560	52,188	46,582	55,717	99,389	96,340
United Provinces ..	16,991	10,308	13,878	20,441	18,496	14,367	19,236
Central Provinces and Berar	40,762	20,861	6,924	16,243	15,771	20,743	17,462
Punjab	3,910	4,739	3,760	4,361	4,307	2,317	2,149
Total ..	125,189	100,438	104,074	111,988	148,700	211,795	215,279

APPENDIX IV.

MADRAS ACT No. XX OF 1933.

PASSED BY THE LEGISLATIVE COUNCIL OF MADRAS.

[*Received the assent of the Governor on the 30th March 1933 and that of the Governor-General on the 10th June 1933, the assent of the Governor-General was first published in the "Fort St. George Gazette" on the 25th July 1933.*]

An Act to provide for the better regulation of buying and selling of commercial crops and the establishment of markets for commercial crops, in the Presidency of Madras.

WHEREAS it is expedient to provide for the better regulation of the buying and selling of commercial crops in the Presidency of Madras and for that purpose to establish markets and make rules for their proper administration ;

AND WHEREAS the previous sanction of the Governor-General has been obtained to the passing of this Act ;

It is hereby enacted as follows :—

Short title and extent.

1. (1) This Act may be called the Madras Commercial Crops Markets Act, 1933.

(2) It extends to the whole of the Presidency of Madras.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context,

(*i*) "commercial crop" means cotton, groundnut or tobacco ;

(*ii*) "grower of a commercial crop" shall not include a dealer or broker in that crop although he may grow that crop. If a question arises as to whether any person is a grower of a commercial crop or not for the purposes of this Act, the decision of the Collector of the district in which the notified area is situated shall be final ;

(*iii*) "local body" means the Corporation of Madras or a municipal council or a taluk board or a panchayat constituted under any enactment for the time being in force ;

(*iv*) "notified area" means any area notified under section 4 ;

(*v*) "prescribed" means prescribed by rules or by-laws made under this Act ; and

(*vi*) "taluk board" means a taluk board constituted under the Madras Local Boards Act, 1920, and where in any part of a district there is no taluk board the district board constituted under the said Act.

Notification of intention of exercising control over purchase and sale of commercial crop in specified area.

3. The Local Government may, by notification in the *Fort St. George Gazette*, declare their intention of exercising control over the purchase and sale of such commercial crop or crops and in such area comprised in the district, as may be specified in the notification. Such notification shall state that any objections or suggestions which may be received by the Local Government, within a period to be specified in the notification, will be considered by them.

A copy of the notification shall be published in the prescribed manner.

Declaration of notified area.

4. (1) After the expiry of the period specified in the notification under section 3 and after considering such objections and suggestions as may be received before such expiry, the Local Government may, by notification and in any other manner prescribed declare the area notified under section 3 or any portion thereof to be a notified area for the purposes of this Act in respect of the commercial crop or crops notified under section 3 or any of them. From the date of issue of such notification or from such later date as may be specified therein, no person shall within the notified area set up, establish or continue or allow to be continued any place for the purchase and sale of the commercial crop or crops so notified, except under a license granted by the Local Government and except in accordance with the provisions of this Act, the rules and by-laws made thereunder and the conditions specified in the license.

Explanation.—A person shall not be deemed to set up, establish or continue or allow to be continued a place as a place for the purchase and sale of a commercial crop within the meaning of this section if he sells his own crop or if he purchases in quantities not exceeding those prescribed, any commercial crop for his private use.

(2) The Local Government may, on the report of the Collector of the district or of the market committee, and after such enquiry as they deem fit, cancel or suspend any license granted under sub-section (1).

Establishment of market committee.

5. The Local Government shall establish a market committee for every notified area. It shall be the duty of the market committee to enforce the provisions of this Act and the rules and by-laws made thereunder in such notified area and when so required by the Local Government to establish a market therein providing for such facilities, as the Local Government may from time to time direct, in connexion with the purchase and sale of the commercial crop or crops concerned.

Constitution of committee.

6. (1) Every market committee shall consist of twelve members. Of these—

(*i*) five shall be persons elected from among themselves by the growers of the commercial crop or crops in such area as the Local Government may determine;

(*ii*) two shall be persons nominated by the Local Government;

(*iii*) one shall be a person elected—

(*a*) by the councillors of the Corporation of Madras from among themselves in case the notified area is the City of Madras,

(*b*) by the members of the municipal council from among themselves, in case the notified area is a municipality,

(*c*) by the members of the taluk board from among themselves, in case the notified area is a non-panchayat area

(*d*) by the members of the panchayat from among themselves, in case the notified area is a panchayat area, or

(*e*) by the members of all the local bodies concerned from among themselves, in case the notified area falls within the jurisdiction of more than one local body ; and

(*iv*) four shall be persons elected by persons licensed under section 4.

(2) Every member shall hold office for a period of three years from the date of his election or nomination, as the case may be :

Provided that a member elected under clause (*iii*) of sub-section (1) shall cease to hold office as member if he ceases to be a member of the electorate by which he was elected.

(3) Every market committee shall elect one of its members to be its chairman.

Incorporation of committees.

7. Every market committee shall be a body corporate by such name as the Local Government may specify in the notification establishing it, shall have perpetual succession and a common seal, may sue and be sued in its corporate name, and shall be competent to acquire and hold property, both moveable and immoveable, to lease, sell or otherwise transfer any moveable or immoveable property which may have become vested in or been acquired by it, and to contract and to do all other things necessary for the purposes for which it is established.

Sub-committees and joint committees and delegation of powers.

8. The market committee may appoint one or more of its members to be a sub-committee or to a joint committee for the conduct of any work or to report on any matter, and may delegate to any one or more of its members such of its own powers or duties as it may think fit.

Appointments and salaries of officers and servants of market committee.

9. (1) Subject to such rules as may be made by the Local Government, in this behalf, a market committee may employ such officers and servants as may be necessary for the management of the market, may pay such officers and servants such salaries as it may think fit and shall have power to control and punish them. The Committee may also provide for the payment to its officers and servants of such leave allowances, pensions, gratuities or compassionate allowances as it deems proper ; and may contribute to any provident fund which may be established for the benefit of such officers and servants.

(2) The Committee shall in the case of any officer or servant of Government, which it employs, pay Government such contribution towards the pension and leave allowances of such officer or servant as may be payable under the regulations in that behalf in force for the time being.

Execution of contracts.

10. (1) Every contract entered into by the market committee shall be in writing and shall be signed on behalf of the market committee by the chairman and two other members of the committee.

(2) No contract other than a contract executed as provided in sub-section (1) shall be binding on a market committee.

Levy of fees.

11. The market committee shall, subject to such rules as may be made in this behalf, levy fees on the commercial crop or crops bought and sold by licensees in the notified area.

Market Committee Fund.

12. (1) All moneys received by a market committee shall be paid into a fund to be called the "Market Committee Fund." All expenditure incurred by the market committee under or for the purposes of this Act shall be defrayed out of the said fund ; and any surplus remaining after such expenditure has been met shall be invested in such manner as may be prescribed by rules.

(2) (*a*) Every market committee shall out of its fund pay to the Local Government the cost of any special or additional staff employed by the Local Government in consultation with the committee for giving effect to the provisions of this Act in the notified area.

(*b*) The Local Government shall determine the cost of such special or additional staff and shall, where the staff is employed for the purposes of more than one market committee, apportion such cost among the committees concerned in such manner as they think fit. The decision of the Local Government determining the amount payable by any market committee shall be final.

Purposes for which the fund may be expended.

13. Subject to the provisions of section 12 the market committee fund shall be expended for the following purposes only—

(*i*) the acquisition of a site or sites for the market;

(*ii*) the maintenance and improvement of the market;

(*iii*) the construction and repair of buildings which are necessary for the purposes of such market and for the health, convenience and safety of the persons using it;

(*iv*) the provision and maintenance of standard weights and measures;

(*v*) the pay, pensions, leave allowances, gratuities, compassionate allowances and contributions towards leave allowances, pensions or provident fund of the officers and servants employed by the market committee;

(*vi*) the expenses of and incidental to elections;

(*vii*) the payment of interest on loans that may be raised for purposes of the market and the provision of a sinking fund in respect of such loans;

(*viii*) the collection and dissemination of information regarding all matters relating to crop statistics and marketing in respect of the commercial crop or crops concerned; and

(*ix*) propaganda in favour of agricultural improvement and thrift.

No trade allowance permissible except as prescribed by rules, or by-laws.

14. No trade allowance, other than an allowance prescribed by rules or by-laws made under this Act, shall be made or received in a notified area by any person in any transaction in respect of the commercial crop or crops concerned and no Civil Court shall, in any suit or proceeding arising out of any such transaction, have regard to any trade allowance not so prescribed.

Explanation.—Every deduction other than deductions on account of deviation from sample, when the purchase is made by sample, or of deviation from standard, when the purchase is made by reference to a known standard, or on account of difference between the actual weight of the sacking and the standard weight, or on account of the admixture of foreign matter, shall be regarded as a trade allowance for the purposes of this Act.

Power to borrow.

15. (1) Every market committee may, with the previous sanction of the Local Government, raise the money required for carrying out the purposes for which it is established on the security of any property vested in and belonging to the market committee, and of any fees leviable by the market committee under this Act. The committee may, for the purpose of meeting the initial expenditure on lands, buildings and equipment required for establishing the market, obtain a loan from the Local Government.

(2) The conditions under which such money or loan shall be raised and the time within which the same shall be repayable shall be subject to the previous sanction of the Local Government.

Supersession of market committee.

16. (1) If, in their opinion, a market committee is not competent to perform or persistently makes default in performing the duties imposed on it by or under this Act, or abuses its powers, the Local Government may, by notification in the *Fort St. George Gazette*, supersede such committee

Provided that before issuing a notification under this sub-section, the Local Government shall give a reasonable opportunity to the market committee for showing cause against the proposal and shall consider the explanations and objections, if any, of the market committee.

(2) Upon the publication of a notification under sub-section (1) superseding a market committee, the following consequences shall ensue :—

(*a*) all the members as well as the chairman of the market committee shall, as from the date of such publication, be deemed to have vacated their offices;

(*b*) the Local Government may, at their discretion, by order, either constitute a new committee under section 5 or make such arrangements for the carrying out of the functions of the committee, as the Local Government may think fit; and

(*c*) all the assets vested in the committee shall, subject to all its liabilities, vest in the Local Government.

(3) (*a*) If the Local Government make an order under clause (*b*) of sub-section (2), they shall transfer the assets and liabilities of the market committee, as on the date of such transfer, to the new committee constituted under section 5 or to the person or persons, if any, appointed for carrying out the functions of the committee, as the case may be.

(*b*) If the Local Government do not make such an order, they shall transfer all the assets of the market committee which remain after the satisfaction of all its liabilities, to the local body within whose jurisdiction the market committee is situated, or if there is more than one such local body, to each of such bodies in such proportion as the Local Government may determine.

(*c*) Any local body to which any assets have been transferred under clause (*b*) shall employ such assets for any object of public utility in the area within its jurisdiction.

Penalties.

17. Whoever contravenes the provisions of section 4 shall be punishable with fine which may extend to five hundred rupees, and in the case of a continuing contravention with a further fine which may extend to one hundred rupees for every day during which the contravention is continued after conviction therefor.

Rules.

18. (1) The Local Government may, either generally or specially for any notified area or areas, make rules consistent with this Act for carrying out all or any of the purposes thereof.

(2) In particular and without prejudice to the generality of the foregoing power such rules may provide for or regulate—

(*i*) the election and nomination of members of a market committee, and the manner of election, the preparation and revision of lists of voters from time to time, and the payment of all expenditure in connexion with or incidental to such election;

(*ii*) the election of the chairman of a market committee and his term of office ;

(*iii*) the filling of casual vacancies in the office of chairman or member of a market committee ;

(*iv*) the maximum annual fees which may be levied by the market committee in respect of licenses granted to traders under section 4 and on the commercial crop or crops bought and sold by them in the notified area, and the recovery of such fees ;

(*v*) the issue by a market committee of licenses to brokers, weighmen, measurers and surveyors, the form in which, and the conditions under which, such licenses shall be issued or renewed, and the fees to be charged therefor ;

(*vi*) the kind and description of the scales, weights and measures which alone may be used in transactions in the commercial crop or crops in a notified area ;

(*vii*) the periodical inspection, verification and correction of all scales, weights and measures in use in a notified area ;

(*viii*) the trade allowances which may be made or received by any person in any transaction in a commercial crop or crops in a notified area ;

(*ix*) the provision of facilities for the settlement of any dispute between a buyer and seller of a commercial crop or their agents including disputes regarding the quality or weight of the article, the allowances for wrappings, dirt or impurities or deductions from any cause ;

(*x*) the prohibition of brokers from acting in any transaction on behalf of both the buyer and seller of a commercial crop ;

(*xi*) the provision of accommodation for storing any commercial crops brought into the market ;

(*xii*) the preparation of plans and estimates for works proposed to be constructed partly or wholly at the expense of the market committee, and the grant of sanction to such plans and estimates ;

(*xiii*) the form in which the accounts of a market committee shall be kept, the audit and publication of such accounts, and the charges, if any, to be made for such audit ;

(*xiv*) the preparation and submission for sanction of an annual budget and the reports and returns to be furnished by a market committee ; and

(*xv*) the investment and disposal of the surplus funds of a market committee.

(3) Any rule made under this section may provide that any contravention thereof or of any of the conditions of any license issued or renewed thereunder shall be punishable with fine which may extend to two hundred rupees.

(4) (*a*) The power to make rules conferred by this section is subject to the condition of the rules being made after previous publication.

(*b*) All rules made under this section shall be published in the *Fort St. George Gazette* and on such publication shall have effect as if enacted in this Act.

(*c*) All such rules shall be laid on the table of the Legislative Council.

19. (1) Subject to any rules made by the Local Government under section 18 and with the previous sanction of the Collector of the district, a market committee may in respect of the market under its management make by-laws for the regulation of the business and the conditions of trading therein.

By-laws.

(2) Any by-law made under this section may provide that contravention thereof shall be punishable with fine which may extend to fifty rupees.

20. (1) No offence made punishable by this Act or any rule or by-law made thereunder shall be tried by a court inferior to that of a Presidency Magistrate or a Magistrate of the first class.

Trial of offences.

(2) Prosecutions under this Act may be instituted by any person duly authorized in writing by the market committee in this behalf.

(3) All fines recovered from an offender shall be credited to provincial revenues and a grant equivalent to such fines shall be paid to the market committee.

Recovery of sums due to Government from market committee.

21. All sums due from a market committee to the Local Government may be recovered in the same manner as arrears of land revenue.

Delegation of Collector's powers.

22. With the previous sanction of the Local Government which may be accorded by general or special order, the Collector of the district may, by an order in writing, delegate to any revenue officer not below the rank of a tahsildar all or any of his powers or duties under this Act or the rules framed thereunder.

APPENDIX V.

BOMBAY ACT No. IV OF 1932.

[*First published, after having received the assent of the Governor-General, in the "Bombay Government Gazette" on the 28th October* 1932.]

An Act to provide for the better regulation and control of transactions in Cotton in Bombay.

WHEREAS it is expedient to provide for the better regulation and control of transactions in cotton and whereas the previous sanction of the Governor-General required by sub-section (3) of section 80A of the Government of India Act* has been obtained for the passing of this Act; It is hereby enacted as follows:—

Short title. 1. This Act may be called the Bombay Cotton Contracts Act, 1932.

Extent and operation. 2. (1) This Act shall apply to the City of Bombay and the Island of Salsette.

(2) It shall come into operation on such date as the Governor in Council may, by notification in the *Bombay Government Gazette*, direct.

(3) Sections 9 and 10 of this Act shall remain in force for a period of five years from the date on which this Act shall have come into operation under sub-section (2).

Definitions. 3. In this Act, unless there is anything repugnant in the subject or context—

(*a*) "Bombay" means the City of Bombay and the Island of Salsette;

(*b*) "Board of Control" means a board appointed for the time being by the Governor in Council as provided in section 9;

(*c*) "Board of Directors" means a board of directors of a recognized cotton association constituted under section 5 and acting through at least a quorum of their members at a meeting of that board duly called and constituted;

(*d*) "Certified godown" means a godown maintained by a cotton association for storing cotton certified under the by-laws of the association;

(*e*) "Contract" means a contract made or to be performed in whole or in part in Bombay relating to the sale or purchase of cotton and includes options in cotton, but does not include such contracts as the Governor in Council may, by notification in the *Bombay Government Gazette*, declare to be excluded from the provisions of this Act;

(*f*) "Cotton Association" means any association, organization or a body of individuals, whether incorporated or not, established or formed for the purpose of regulating and controlling business in the sale, purchase or other transactions in cotton;

(*g*) "Forward contract" means a contract for the delivery of cotton at some future date;

* 5 and 6 Geo. V, c. 61.

(*h*) " Option in cotton " means a contract made or to be performed in whole or in part in Bombay for the purchase or sale of a right to buy, or a right to sell, or a right to buy or sell cotton in future, and includes a *teji*, a *mandi* or a *teji-mandi* in cotton ;

(*i*) " Ready contract " means a contract in which immediate delivery of cotton is contemplated ;

(*j*) " Recognized cotton association " means a cotton association which is for the time being recognized by the Governor in Council, as provided in section 4.

Recognition.

4. (1) A cotton association, desirous of being recognized for the purposes of this Act, shall make an application in writing to the Governor in Council for such recognition and shall submit by-laws for the regulation and control of transactions in cotton and furnish such information in regard to such recognition as the Governor in Council may from time to time require.

(2) The Governor in Council may give or refuse such recognition.

(3) The Governor in Council shall refuse recognition unless—

(*a*) it is provided in the by-laws submitted by the cotton association under sub-section (1) that not less than one-fourth of the total number of the Board of Directors of the cotton association applying for recognition shall be growers of cotton to be appointed in the manner prescribed in the said by-laws and approved by the Governor in Council ; and

(*b*) the Governor in Council is satisfied that the sole possession and effective management, control and regulation of the markets of the cotton association applying for recognition and of the market places of the said cotton association are vested in the said cotton association.

(4) The Governor in Council shall also refuse recognition unless the by-laws submitted by the cotton association under sub-section (1) shall have been published in the *Bombay Government Gazette* at least one month before the date of such recognition :

Provided that when, in the opinion of the Governor in Council, the conditions precedent to recognition specified in sub-clauses (*a*) and (*b*) of sub-section (3) are satisfied in the case of a cotton association applying for recognition under sub-section (1) and the by-laws of the said cotton association are similar in all other material respects to the articles and by-laws of the East India Cotton Association, Limited, deemed or which have been deemed under the provisions of sub-section (7) to be by-laws of a recognized cotton association, the Governor in Council may dispense with the publication, required under this sub-section, of the by-laws of the cotton association applying for recognition and may give recognition to such association and the by-laws of such association shall then be deemed to be by-laws published under the provisions of this sub-section.

(5) When the Governor in Council has dispensed with the publication of the by-laws of a cotton association and has given recognition to such association under the provisions of the proviso to sub-section (4), such by-laws shall be published in the *Bombay Government Gazette* next following the giving of recognition to such association.

(6) The Governor in Council may, at any time after having given to a cotton association an opportunity to explain why recognition should not be withdrawn, withdraw the recognition given to the said cotton association and such cotton association shall thereupon cease to be a recognized cotton association.

(7) It is hereby declared that the East India Cotton Association, Limited, is a recognized cotton association for the purposes and subject to the provisions of this Act and the articles and by-laws of the said Association shall, so far as they relate to matters for which by-laws may be made under the provisions of sections 5 and 6, be deemed to be by-laws of a recognized cotton association :

Provided that, if, within such time after the coming into operation of this Act as the Governor in Council shall by order in writing specify, the said Association shall not have complied with the conditions precedent to recognition specified in clauses (*a*) and (*b*) of sub-section (3), the said association shall cease to be a recognized cotton association and the said articles and by-laws of the said association shall cease to be by-laws of a recognized cotton association.

Explanation.—A grower of cotton shall not include a person who deals in forward contracts.

Recognized association to have Board of Directors: power to make by-laws.

5. (1) Subject to the provisions of section 9, in every recognized cotton association there shall be a Board of Directors. Subject to the sanction of the Governor in Council, a recognized cotton association may make and may, from time to time, add to, vary or rescind by-laws providing for—

(*a*) the constitution of the Board of Directors,

(*b*) the powers and duties of the Board of Directors and the manner in which its business shall be conducted,

(*c*) the number and constitution of electoral panels and the representation upon such panels, and

(*d*) the method of appointment of members to the Board of Directors.

(2) By-laws made, added to, varied or rescinded under sub-section (1) shall be laid upon the table of the Bombay Legislative Council at the session of the said Council next following and shall be liable to be modified or rescinded by a resolution of the said Council. If any by-law is so modified or rescinded, the Governor in Council may sanction such modified by-law and re-publish the same accordingly or may sanction such rescission.

Power of Board of Directors to make by-laws.

6. (1) The Board of Directors may, subject to the sanction of the Governor in Council, make and, from time to time, add to, vary or rescind by-laws for the regulation and control of transactions in cotton.

(2) In particular and without prejudice to the generality of the foregoing provision, such by-laws may provide for—

(*a*) the admission of various classes of members of a recognized cotton association and the exclusion, suspension, expulsion and re-admission of such members;

(*b*) the opening and closing of markets in cotton and the times during which such markets shall be opened or closed and regulating the hours of trade;

(*c*) a clearing house for the periodical settlement of contracts or differences thereunder and for the passing on of delivery orders and for any purpose in connection with options in cotton, and the regulation and maintenance of such clearing house;

(*d*) the number and classes of contracts in respect of which settlements shall be made or differences paid through the clearing house;

(*e*) fixing, altering or postponing settling days;

(*f*) determining and declaring the market rates for cotton of any and every description;

(*g*) the terms, conditions and incidents of contracts and the forms of such contracts as are in writing;

(*h*) regulating the making, performance and cancellation of contracts, including contracts between a commission agent and his constituent, or between a broker and his constituent, or between a jethawala or muccadum and his constituent, or between a member and a non-member of a recognized cotton association, and the consequences of insolvency on the part of a seller or buyer or intermediary, the consequences of a breach or omission by a seller or buyer and the responsibility of commission agents, muccadums and brokers not parties to such contracts;

(*i*) the prohibition of specified classes or types of dealings in cotton by a member of a recognized cotton association;

(*j*) the settlement of claims and disputes by arbitration and appeals against awards;

(*k*) the levy and recovery of subscriptions, fees, fines and penalties;

(*l*) disciplinary measures against members of a recognized cotton association, including suspension, expulsion, fines and non-monetary penalties, for breach of any by-law made by the Board of Directors;

(*m*) regulating the course of business between parties to contracts in any capacity;

(*n*) the institution, maintenance and control of certified godowns; and

(*o*) regulating the making, performance and cancellation of options in cotton.

(3) If any person committing a breach of any by-law of a recognized cotton association is a company, every director and officer of such company shall also be deemed to have committed such breach, unless he proves that the breach was committed without his knowledge and control.

Publication of by-laws.

7. By-laws made under section 5 or 6 shall be subject to the condition of previous publication and, when sanctioned by the Governor in Council, shall be published in the *Bombay Government Gazette*.

Void contracts.

8. (1) Save as hereinafter provided in this Act, any contract (whether either party thereto is a member of a recognized cotton association or not) which is entered into after the date on which this Act comes into operation and which is not in accordance with the by-laws of any recognized cotton association shall be void.

(2) No claim shall be allowed in any court for the recovery of any commission, brokerage, fee or reward in respect of any such contract.

Supersession of Board of Directors and appointment of Board of Control, its powers and duties.

9. (1) When the Governor in Council is of the opinion that it is necessary, in order to secure free trading in the market and to prevent obstruction thereto and interference therewith, to supersede any Board of Directors, the Governor in Council may, after having given to the Board of Directors a reasonable opportunity to explain why the said Board should not be superseded, by notification in the *Bombay Government Gazette*, declare such Board to be superseded and may appoint in the place of such Board such persons as he thinks fit to constitute a Board of Control and may appoint one of their number to be Chairman.

(2) When the Governor in Council has appointed a Board of Control under the provisions of sub-section (1), the members of the Board of Directors which has been superseded shall, from the date of the notification, vacate their office as such members.

(3) The Board of Control appointed under sub-section (1) shall hold office for such period as the Governor in Council may, by notification in the *Bombay Government Gazette*, appoint.

(4) When a Board of Control has been appointed under sub-section (1), the Governor in Council may make by-laws to be published in the *Bombay Government Gazette* prescribing the powers and duties of a Board of Control and the manner in which its business shall be conducted.

(5) The Board of Control appointed under sub-section (1) may, subject to the provisions of sub-section (4), exercise all or any of the powers vested in or exercisable by the Board of Directors which it superseded.

(6) Notwithstanding anything contained in the by-laws of the recognized cotton association, a Board of Control may, subject to the previous sanction of the Governor in Council, rescind, add to or vary the by-laws of the said Association and may, subject to a like sanction, make all or any such by-laws as may be made by the Board of Directors under the provisions of section 6 and which, in the opinion of the Board of Control, may be necessary for carrying out the purposes of this Act; and all or any such by-laws shall be deemed by-laws of the recognized cotton association.

(7) When a Board of Control has been appointed under sub-section (1), all such property of the recognized cotton association as such Board may by order in writing declare to be necessary for carrying out the purposes of this Act shall vest in such Board. The property so vested in such Board or which such Board may have acquired shall, on the determination of the period of office of such Board, re-vest or vest, as the case may be, in the recognized cotton association.

(8) On the determination of the period of office of the Board of Control appointed under sub-section (1) the recognized cotton association shall forthwith constitute a Board of Directors in accordance with the by-laws of the association.

Prohibition of certain contracts after the appointment of the Board of Control.

10. (1) When a Board of Control has been appointed under section 9, the Governor in Council may, by notification published in the *Bombay Government Gazette*, declare that after the date appointed in the said notification, any forward or ready contract entered into except by or through the agency of a member of a recognized cotton association shall be void.

(2) No court shall entertain any suit or proceeding relating to any contract declared to be void under the provisions of sub-section (1) and no claim shall be allowed in any court for the recovery of any commission, brokerage, fee or reward in respect of any such contract.

(3) Any person entering into such contract shall, on conviction, be liable to a fine not exceeding Rs. 1,000 for such offence.

Bar of suits and proceedings against officers, etc.

11. No suit, prosecution or other legal proceedings whatsoever shall be entertained in any court against any officer or servant of a recognized cotton association or Board of Control for anything in good faith done or intended to be done in pursuance or execution of this Act or by-laws made thereunder.

Savings.

12. (1) Contracts entered into under the provisions of the Bombay Cotton Contracts Act, 1922,* shall be deemed to be valid, except in so far as they may be inconsistent with any of the provisions of this Act and by-laws made thereunder.

(2) Forward contracts entered into before the date when this Act comes into operation and which would not have been void under the provisions of the Bombay Cotton Contracts Act, 1922,* shall not be deemed to be void merely because they contravene the provisions of this Act and by-laws made thereunder.

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* Bom. XIV of 1922.

APPENDIX VI.

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS AND THE TRADE ON 31ST AUGUST 1933.

(In thousand bales of 400 lbs. each.)

N.B.—The stocks, shown in this table as held by the trade, are those collected by the East India Cotton Association for Bombay, the Karachi Cotton Association for Karachi, the Ahmedabad Millowners' Association for Ahmedabad, the Punjab Chamber of Commerce for Delhi, and the Northern India Chamber of Commerce for the whole of the Punjab. Figures of mill stocks were collected by the Indian Central Cotton Committee direct from the mills.

Stocks held	Bengals. (*a*)	Oomras. (*b*)	Verum and Hyderabad Gaorani.	Americans. (*c*)	Broach.	Dholleras.	Southerns. (*d*)	Other sorts. (*e*)	Total.
By the Trade in :—									
Bombay	38	139	..	11	106	85	88	16	483
Karachi	43	..	..	20	..	..	..	7	70
Ahmedabad	..	..	..	..	..	7	..	..	7
Delhi	10	..	..	3	..	..	..	..	13
Punjab	6	..	..	5	..	..	..	..	11
Trade—Total ..	97	139	..	39	106	92	88	23	584
By the Indian Mills (*f*)	43	90	78	51	129	39	236	8	674
GRAND TOTAL ..	140	229	78	90	235	131	324	31	1,258

(*a*) Includes United Provinces, Punjab-*desi*, Sind-*desi* and Rajputana cottons.
(*b*) Includes Central Provinces, Berar, Khandesh, Central India and Barsi and Nagar cottons.
(*c*) Includes Punjab-Americans, Sind-Americans and Dharwar-Americans.
(*d*) Includes Kumpta, Westerns, Northerns, Coconadas, Tinnevellies, Karunganni, Cambodia and Salems.
(*e*) Includes Comillas, Burmas and unclassified old crop.
(*f*) For details see table attached.

STOCKS OF RAW COTTON HELD BY

(Compiled from Voluntary

(In thousand bales

Trade Descriptions of Cotton	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras North.	Madras South.	Total Madras Presidency.	United Provinces.	Central Provinces.	Berar.	Total C. P. and Berar.
BENGALS—											
United Provinces	1	..	..	1	..	4	4	7	..	..	..
Sind-Punjab	1	..	..	1	..	..	..	1	..	..	..
Rajputana	6	..	1	7	..	..	..	..	..	..	..
Others	2	..	..	2	..	..	..	1	..	..	..
Total ..	10	..	1	11	..	4	4	9	..	..	..
OOMRAS—											
Central Provinces	2	..	..	2	..	..	..	..	18	1	19
Berar	3	..	1	4	..	..	..	..	3	1	4
Khandesh	2	1	13	16	..	..	..	..	1	..	1
Central India	3	2	..	5	..	..	..	3	..	..	..
Barsi and Nagar	1	..	1	2	..	..	..	..	..	..	..
Total ..	11	3	15	29	..	..	..	3	22	2	24
VERUM 262	1	..	..	1	..	..	..	..	3	2	5
HYDERABAD GAORANI ..	4	..	36	40	8	..	8	..	13	2	15
Total ..	5	..	36	41	8	..	8	..	16	4	20
AMERICANS—											
Punjab—289-F	2	..	..	2	..	..	..	..	..	..	..
Punjab (Unspecified—4-F)	6	..	..	6	..	3	3	14	1	..	1
Sind	2	..	..	2	..	..	..	..	..	..	..
Dharwar (Gadag 1) ..	1	..	1	2	..	..	..	..	..	..	..
Dharwar (Upland—Unspecified)	2	..	1	3	..	..	..	..	..	..	..
Total ..	13	..	2	15	..	3	3	14	1	..	1
BROACH—											
Surat-Navsari	28	35	3	66	..	..	..	..	1	..	1
Broach (Unspecified) ..	24	18	2	44	..	7	7	..	..	..	..
Total ..	52	53	5	110	..	7	7	..	1	..	1
DHOLLERAS—											
Mattheo	1	4	1	6	..	..	..	..	..	..	..
Dholleras (Unspecified) ..	4	23	..	27	..	..	..	..	..	..	..
Total ..	5	27	1	33	..	..	..	..	..	..	..
SOUTHERNS—											
Kumptas (Jayawant) ..	7	..	3	10	3	..	3	..	..	..	..
Kumptas (Unspecified) ..	14	..	12	26	15	..	15	1	..	..	..
Westerns	13	..	10	23	8	..	8	..	..	..	..
Northerns	..	..	..	..	13	..	13	..	..	..	..
Coconadas	..	..	1	1	..	..	..	..	..	..	..
Karunganni	1	1	..	2	1	13	14	..	..	..	..
Tinnevellies	..	..	..	..	..	19	19	..	..	..	..
Cambodia (Coimbatore No. 2)	4	1	..	5	2	25	27	..	..	..	..
Cambodia (Unspecified) ..	10	..	..	10	2	14	16	..	..	1	1
Salems (Uppam)	..	..	..	..	..	1	1	..	..	..	..
Total ..	49	2	26	77	44	72	116	1	..	1	1
COMILLAS	..	..	..	..	..	..	..	..	..	..	..
BURMAS	..	..	..	..	..	..	..	..	..	..	..
OTHER SORTS	1	1	..	2	..	1	1	..	..	..	..
Total Indian Cotton ..	146	86	86	318	52	87	139	27	40	7	47
AMERICANS	26	1	..	27	..	1	1	..	..	..	..
EGYPTIANS	3	6	2	11	..	..	..	..	1	..	1
EAST AFRICANS	15	23	5	43	..	..	..	2	..	..	..
OTHERS (Sudan, Mesopotamia, etc.)	4	2	..	6	..	..	..	..	..	..	..
Total Foreign Cotton ..	48	32	7	87	..	1	1	2	1	..	1
Grand Total ..	194	118	93	405	52	88	140	29	41	7	48

THE MILLS IN INDIA ON 31ST AUGUST 1933.

Returns furnished by Mills).

of 400 lbs. each.)

Bengal.	Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.
..	5	..	17	..	..	..	..	..	..	..	..	..	17
1	5	..	8	..	..	..	3	..	..	..	..	3	11
..	..	5	12	..	..	..	..	..	..	..	..	..	12
..	..	..	3	..	..	..	..	..	..	..	..	..	3
1	10	5	40	..	..	..	3	..	..	..	..	3	43
3	..	..	24	..	2	..	..	..	..	1	..	3	27
2	..	..	10	..	..	..	..	..	..	1	..	1	11
..	..	..	17	..	..	..	..	..	..	..	..	..	17
..	..	..	8	..	..	1	7	16	..	1	..	25	33
..	..	..	2	..	..	..	..	..	..	..	..	..	2
5	..	..	61	..	2	1	7	16	..	3	..	29	90
..	..	..	6	..	..	..	..	..	..	..	..	..	6
..	..	..	63	8	..	..	1	..	..	..	..	9	72
..	..	..	69	8	..	..	1	..	..	..	..	9	78
1	..	..	3	..	..	..	..	..	..	..	..	..	3
2	4	4	34	..	3	..	..	..	..	1	3	7	41
..	..	..	2	..	..	..	..	..	..	..	..	..	2
..	..	..	2	..	..	..	..	..	..	..	..	..	2
..	..	..	3	..	..	..	..	..	..	..	..	..	3
3	4	4	44	..	3	..	..	..	..	1	3	7	51
1	..	..	68	..	..	4	..	1	1	..	..	6	74
..	..	..	51	..	..	2	..	..	..	1	1	4	55
1	..	..	119	..	..	6	..	1	1	1	1	10	129
..	..	..	6	..	..	..	..	..	1	..	..	1	7
..	..	..	27	..	..	2	..	..	3	..	..	5	32
..	..	..	33	..	..	2	..	..	4	..	..	6	39
..	..	..	13	..	..	..	..	..	..	..	..	..	13
..	..	..	42	..	11	..	..	..	..	..	1	12	54
1	..	..	32	..	11	..	..	..	..	..	2	13	45
..	..	..	13	..	4	..	..	..	..	..	..	4	17
1	..	..	2	..	..	..	..	..	..	..	1	1	3
1	..	..	17	..	..	..	..	..	..	1	..	1	18
..	..	..	19	..	..	..	..	..	..	..	..	..	19
2	..	..	34	..	1	..	..	..	..	..	..	1	35
1	..	..	28	..	2	..	..	..	..	..	1	3	31
..	..	..	1	..	..	..	..	..	..	..	..	..	1
6	..	..	201	..	29	..	..	..	..	1	5	35	236
..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	2	2	..	..	..	..	..	..	..	..	..	2
..	..	..	3	3	..	..	..	..	..	..	..	3	6
16	14	11	572	11	34	9	11	17	5	6	9	102	674
1	..	..	29	..	..	..	..	1	..	..	..	1	30
..	..	..	12	..	..	1	..	..	..	..	..	1	13
1	2	..	48	..	..	2	..	1	1	..	..	4	52
..	..	..	6	..	1	..	..	..	..	..	..	1	7
2	2	..	95	..	1	3	..	2	1	..	..	7	102
18	16	11	667	11	35	12	11	19	6	6	9	109	776

APPENDIX

RECEIPTS AT MILLS IN INDIA OF

(COMPILED FROM RETURNS

Cotton Year : 1st September

(In thousand bales of

Trade Descriptions of Cotton.	RECEIPTS AT														
	BOMBAY ISLAND.					AHMEDABAD.					REST OF BOMBAY PRESIDENCY.				
	1928–29	1929–30	1930–31	1931–32	1932–33	1928–29	1929–30	1930–31	1931–32	1932–33	1928–29	1929–30	1930–31	1931–32	1932–33
BENGALS—															
United Provinces	13	24	29	11	8	..	..	..	..	..	..	..	..	..	1
Sind-Punjab	7	12	8	7	6	..	2	..	1	..	..	..	..	..	1
Rajputana	10	18	17	22	21	1	1	1	..	2	1	..	..	..	1
Others (Unclassified)	6	14	9	13	11	2	1	2	..	..	1	..	..	..	..
Total	36	68	63	53	46	3	4	3	1	2	2	..	..	..	3
OOMRAS—															
Central Provinces	16	29	34	17	19	5	4	1	4	..	3	5	3	3	..
Berar	28	31	29	25	19	1	..	..	..	..	1	1	1	..	4
Khandesh	21	24	21	16	15	..	2	2	..	2	22	14	23	19	29
Central India	44	57	62	29	20	21	14	13	6	9	4	6	4	1	..
Barsi and Nagar	21	16	17	7	4	5	3	..	1	..	13	4	7	7	15
Unclassified	8	14	10	5	..	4	5	3	..	..	5	5	3	8	..
Total	138	171	173	99	77	36	28	19	11	11	48	35	41	38	48
VERUM 262	..	..	..	..	6	..	..	..	..	..	..	..	..	..	1
HYDERABAD GAORANI	39	61	32	9	20	7	3	2	..	..	42	54	49	33	56
Total	39	61	32	9	26	7	3	2	..	..	42	54	49	33	57
AMERICANS—															
Punjab—289-F	3	18	19	39	3	2	2	1	2	2	..	1	1	2	..
Punjab (Unspecified—4-F)					25					..					
Sind	3	8	8	7	14	1	1	2	1	1	..	..	1	..	..
Dharwar (Gadag I)	6	12	6	5	5	3	2	2	..	..	..	..	..	2	4
Dharwar (Upland—Unspecified)					17										3
Total	12	38	33	51	64	6	5	5	3	3	..	1	2	4	7
BROACH—															
Surat-Navsari	21	35	36	18	49	64	96	101	55	90	1	2	4	8	7
Broach (Unspecified	26	42	59	166	94	41	46	38	42	68	3	1	5	7	4
Total	47	77	95	184	143	105	142	139	97	158	4	3	9	15	11
DHOLLERAS—															
Mattheo	7	1	15	36	17	8	2	2	3	10	..	1	1	1	2
Dholleras (Unspecified)	16	28	27	51	23	56	60	67	87	72	..	2	1	4	1
Total	23	29	42	87	40	64	62	69	90	82	..	3	2	5	3
SOUTHERNS—															
Kumptas (Jayawant)	84	112	76	66	21	6	7	3	1	1	10	9	16	28	7
Kumptas (Unspecified)					47					..					27
Westerns	28	52	55	38	46	7	6	3	2	1	14	12	11	10	27
Northerns	3	4	2	3	..	2	4	1	1	..	..	..	..	6	..
Coconadas	1	1	1	..	1	..	..	..	..	1	1	1	..	2	2
Karunganni	8	10	6	4	3	1	..	1	1	..	..	1	1	..	..
Tinnevellies	1	1	2	3	3	..	1	1	4	..	..	..	..	..	..
Cambodia (Coimbatore No. 2)	14	27	21	13	7	5	3	1	..	1	1	..	..	1	..
Cambodia (Unspecified)					20					..					..
Salems (Uppam)	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..
Unclassified	12	31	..	13	..	7	8	4	1	..	..	..	..	2	5	..
Total	151	239	163	140	148	28	31	14	9	4	26	23	30	52	63
COMILLAS	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
BURMAS	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..
OTHER SORTS	1	4	2	1	6	4	2	3	..	8	..	..	..	3	..
Total Indian Cotton	447	688	604	624	550	253	277	254	211	268	122	119	133	150	192
AMERICANS					76					2					
EGYPTIANS					11					19					1
EAST AFRICANS	28	67	187	285	55	24	28	52	79	87	4	4	18	22	2
OTHERS (Sudan, Mesopotamia, etc.)					11					9					13
															1
Total Foreign Cotton	28	67	187	285	153	24	28	52	79	117	4	4	18	22	17
Grand Total	475	755	791	909	703	277	305	306	290	385	126	123	151	172	209
Indian Raw Cotton consumed in Indian Mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act).	542	766	665	612	585	319	344	322	322	348	184	191	187	198	203

VII.

RAW COTTON CLASSIFIED BY VARIETIES.

FURNISHED BY MILLS.)

to 31st August.

400 lbs. each.)

MILLS IN

Bombay Presidency.					Madras Presidency.					United Provinces.				
1928-29	1929-30	1930-31	1931-32	1932-33	1928-29	1929-30	1930-31	1931-32	1932-33	1928-29	1929-30	1930-31	1931-32	1932-33
13	24	29	11	9	..	2	1	1	1	63	90	102	89	87
7	14	8	8	7	..	..	..	1	1	12	18	7	13	6
12	19	18	22	24	..	1	1	1	..	..	..	..	13	..
9	15	11	13	11	2	2	1	..	..	..	1	..	..	4
41	72	66	54	51	2	5	3	3	2	75	109	109	115	97
24	38	38	24	19	1	2	2	1	1	4	5	6	2	6
30	32	30	25	23	..	..	1	..	..	13	17	10	1	2
43	40	46	35	46	1	1	..	..	..	..	..	..	..	..
69	77	79	36	29	..	..	1	..	..	21	30	36	15	24
39	23	24	15	19	1	..	..	1	..	..	..	..	..	..
17	24	16	13	..	6	3	2	..	..	..	1	..	..	..
222	234	233	148	136	9	6	6	2	1	38	53	52	18	32
..	..	..	..	7	..	..	..	..	..	..	..	..	..	..
88	118	83	42	76	..	1	..	..	10	..	..	..	..	..
88	118	83	42	83	..	1	..	..	10	..	..	..	..	..
5	21	21	43	5	..	2	9	39	1	15	30	42	53	4
				25					18					51
4	9	11	8	15	..	..	2	2	..	..	..	..	..	..
9	14	8	7	9	..	..	..	..	..	..	..	..	..	..
				20					2					..
18	44	40	58	74	..	2	11	41	21	15	30	42	53	55
86	133	141	81	146	..	2	..	1	..	..	..	1	..	..
70	89	102	215	166	2	2	3	2	12	..	1	..	1	1
156	222	243	296	312	2	4	3	3	12	..	1	1	1	1
15	4	18	40	29	..	..	..	..	..	..	..	..	..	..
72	90	95	142	96	..	..	..	..	..	..	..	..	..	..
87	94	113	182	125	..	..	..	..	..	..	..	..	..	..
100	128	95	95	29	14	9	10	8	4	5	6	1	..	..
				74					16					1
49	70	69	50	74	5	6	14	21	12	6	7	6	8	..
5	8	3	10	..	19	22	15	16	13	..	..	..	..	..
2	2	1	2	4	1	2	1	2	2	..	..	..	..	..
9	12	8	4	3	30	24	30	42	43	..	..	..	..	..
1	2	3	7	3	52	47	41	43	52	..	..	..	..	..
20	30	22	14	8	66	56	60	78	52	1	1	2	..	..
				20					41					..
..	2	..	..	..	2	1	3	3	2	..	..	..	..	..
19	39	6	19	..	5	..	3	4	..	..	..	..	..	..
205	293	207	201	215	194	167	177	217	237	12	14	9	8	1
..	..	1	1	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	6	5	4	14	..	..	..	..	3	..	2	..	..	..
822	1084	991	985	1,010	207	185	200	266	286	140	209	213	195	186
56	99	257	386	78	1	3	5	39	1	..	..	3	5	..
				32					..					1
				155					1					3
				21					..					..
56	99	257	386	287	1	3	5	39	2	..	..	3	5	4
878	1,183	1,248	1,371	1,297	208	188	205	305	288	140	209	216	200	190
1,045	1,301	1,174	1,132	1,116	204	211	215	261	292	183	234	235	257	273

RECEIPTS AT MILLS IN INDIA OF RAW

(In thousand bales of

RECEIPTS AT

Trade Descriptions of Cotton.	C. P. and Berar.					Bengal.				
	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
Bengals—										
United Provinces	..	..	..	..	..	4	7	4	3	5
Sind-Punjab	..	..	..	..	..	2	2	4	2	4
Rajputana	..	..	..	..	..	..	..	..	..	..
Others (Unclassified)	..	..	..	..	..	1	1	3	1	3
Total	..	..	..	..	..	7	10	11	6	12
Oomras—										
Central Provinces	50	51	53	44	44	16	19	23	12	25
Berar	22	19	21	31	12	12	15	14	11	15
Khandesh	..	1	..	1	2	1	2	1	..	..
Central India	1	2	1	1	..	3	1	2	..	..
Barsi and Nagar	1	..	..	..	..	1	..	1	..	..
Unclassified	1	5	8	..	..	..	2	1	2	..
Total	75	78	83	77	58	33	39	42	25	40
Verum 262	..	..	..	..	18	..	..	..	..	..
Hyderabad Gaorani	32	27	28	11	22	2	2	..	1	..
Total	32	27	28	11	40	2	2	..	1	..
Americans—										
Punjab—289-F	2	..	..	6	1	2	8	3	7	1
Punjab (Unspecified—4-F)					1					16
Sind	..	..	1	..	..	..	..	..	..	2
Dharwar (Gadag 1)	..	..	..	..	..	..	..	..	..	..
Dharwar (Upland—Unspecified)										1
Total	2	..	1	6	2	2	8	3	7	20
Broach—										
Surat-Navsari	2	2	2	2	2	..	..	..	1	2
Broach (Unspecified)	..	..	..	1	..	1	2	1	1	..
Total	2	2	2	3	2	1	2	1	2	2
Dholleras—										
Mattheo	..	..	..	..	..	..	..	..	..	..
Dholleras (Unspecified)	2	1	1	..	..	1	..	..	..	..
Total	2	1	1	..	..	1	..	..	..	..
Southerns—										
Kumptas (Jayawant)	..	..	..	..	..	1	1	..	1	..
Kumptas (Unspecified)	..	..	..	..	1					1
Westerns	..	..	..	..	..	7	7	5	5	6
Northerns	..	..	..	..	..	..	1	..	1	..
Coconadas	..	..	..	..	..	2	3	1	3	2
Karunganni	..	..	1	..	..	1	3	4	3	5
Tinnevellies	..	..	..	..	..	..	2	3	1	1
Cambodia (Coimbatore No. 2)	1	1	..	2	..	9	14	9	6	4
Cambodia (Unspecified)										5
Salems (Uppam)	..	..	..	..	..	1	..	..	..	2
Unclassified	..	1	..	..	..	3	..	..	2	..
Total	1	2	1	2	1	24	31	22	22	26
Comillas	..	..	..	..	..	..	..	..	..	..
Burmas	..	..	..	..	..	..	..	..	..	..
Other Sorts	..	..	..	..	..	1	1	1	..	..
Total Indian Cotton	114	110	116	99	103	71	93	80	63	100
Americans	..	1	2	4	..	..	..	2	4	2
Egyptians					1					1
East Africans					1					6
Others (Sudan, Mesopotamia, etc.)					..					1
Total Foreign Cotton	..	1	2	4	2	..	..	2	4	10
Grand Total	114	111	118	103	105	71	93	82	67	110
Indian Raw Cotton consumed in Indian Mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act.)	121	123	118	115	111	84	99	92	102	104

COTTON CLASSIFIED BY VARIETIES—*contd.*

400 lbs. each.)

MILLS IN

Punjab and Delhi.					Rest of British India.					Total British India.				
1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
2	5	..	14	22	..	..	..	..	..	82	128	136	118	124
13	15	41	15	20	2	2	2	..	..	36	51	62	39	38
..	..	..	..	..	3	1	6	19	11	15	21	25	55	35
13	18	..	3	..	..	..	..	..	..	25	37	15	17	18
28	38	41	32	42	5	3	8	19	11	158	237	238	229	215
6	1	1	..	..	..	..	..	..	..	101	116	123	83	95
..	..	..	..	..	..	..	..	..	..	77	83	76	68	52
..	..	..	..	..	..	..	..	..	..	45	44	47	36	48
..	..	..	..	..	..	..	..	1	..	94	110	119	53	53
..	..	..	..	..	..	..	..	..	..	42	23	25	16	19
..	..	..	..	..	..	..	..	..	..	24	35	27	15	..
6	1	1	..	..	..	..	..	1	..	383	411	417	271	267
..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
..	..	..	..	..	..	..	..	..	..	122	148	111	54	108
..	..	..	..	..	..	..	..	..	..	122	148	111	54	133
19	21	31	33	1	..	..	1	6	..	43	82	107	187	18
				26					6					143
..	..	..	..	..	..	..	..	..	..	4	9	14	10	17
..	..	..	..	..	..	..	..	..	..	9	14	8	7	9
				..					..					23
19	21	31	33	27	..	..	1	6	6	56	105	129	204	205
..	..	..	..	..	..	..	..	..	..	88	137	144	85	150
..	..	..	..	..	..	..	..	..	..	73	94	106	220	179
..	..	..	..	..	..	..	..	..	..	161	231	250	305	329
..	..	..	..	..	..	..	..	..	..	15	4	18	40	29
..	..	..	..	..	..	..	..	1	..	75	91	96	143	96
..	..	..	..	..	..	..	..	1	..	90	95	114	183	125
..	..	..	..	..	..	..	..	..	..	120	144	106	104	93
..	..	..	..	..	..	..	..	..	..					93
..	..	..	..	..	..	..	..	..	..	67	90	94	84	92
..	..	..	..	..	..	..	..	..	..	24	31	18	27	13
..	..	..	..	..	..	..	..	..	..	5	7	3	7	8
..	..	..	..	..	..	..	..	..	..	40	39	43	49	51
..	..	..	..	..	..	..	..	..	..	53	51	47	51	56
..	..	..	..	..	..	..	..	..	..					64
..	..	..	..	..	..	..	..	..	..	97	102	93	100	66
..	..	..	..	..	..	..	..	..	..	3	3	3	3	4
..	..	..	..	..	..	..	..	..	..	27	40	9	25	..
..	..	..	..	..	..	..	..	..	..	436	507	416	450	480
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	6	8	9	..	8	6	9	10	..	8
..	..	..	..	..	..	..	..	..	..	6	9	6	4	17
53	60	73	65	69	11	11	18	27	25	1,418	1,752	1,691	1,700	1,779
..	..	2	4	..	..	..	..	..	..	57	103	271	442	82
				..	..	..	..	..	..					35
				3	..	..	..	..	..					169
				..	..	..	..	..	..					22
..	..	2	4	3	..	..	..	..	..	57	103	271	442	308
53	60	75	69	72	11	11	18	27	25	1,475	1,855	1,962	2,142	2,087
55	65	74	90	81	22	25	27	30	32	1,714	2,058	1,995	1,987	2,009

RECEIPTS AT MILLS IN INDIA OF RAW

(In thousand bales of

RECEIPTS AT

Trade Descriptions of Cotton.	Hyderabad.					Mysore.				
	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
Bengals—										
United Provinces	..	..	..	..	..	..	..	..	..	..
Sind-Punjab	..	..	..	..	..	..	..	..	..	..
Rajputana	..	..	..	..	..	..	..	..	..	..
Others (Unclassified)	..	..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	..	..	..	..	..
Oomras—										
Central Provinces	..	..	..	..	..	..	..	..	1	3
Berar	..	..	..	..	..	..	..	..	..	..
Khandesh	..	..	..	..	..	..	..	..	..	..
Central India	..	..	..	..	..	..	1	2	..	..
Barsi and Nagar	10	8	6	5	6	1	1	1	..	..
Unclassified	..	..	..	1	..	..	..	..	..	..
Total	10	8	6	6	6	1	2	3	1	3
Verum 262	..	..	..	..	..	..	..	..	..	..
Hyderabad Gaorani	13	15	12	26	22	..	..	..	..	..
Total	13	15	12	26	22	..	..	..	..	..
Americans—										
Punjab—289-F	2	1	..	1	1	..	..	..	..	..
Punjab (Unspecified—4-F)						..	..	..	..	4
Sind	..	..	..	..	..	..	..	..	..	..
Dharwar (Gadag 1)	..	..	..	..	..	..	..	..	..	..
Dharwar (Upland—Unspecified)	..	..	..	..	..	..	..	..	..	1
Total	2	1	..	1	1	..	..	..	..	5
Broach—										
Surat-Navsari	..	..	..	..	..	..	..	..	..	..
Broach (Unspecified)	..	..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	..	..	..	..	..
Dholleras—										
Mattheo	..	..	..	..	..	..	..	1	..	..
Dholleras (Unspecified)	..	..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	..	..	1	..	..
Southerns—										
Kumptas (Jayawant)	..	..	..	..	..	15	16	15	15	1
Kumptas (Unspecified)	..	..	..	..	..					15
Westerns	..	..	..	..	..	19	14	12	14	18
Northerns	..	..	..	..	..	7	5	1	6	5
Coconadas	..	..	..	..	..	..	1	..	..	..
Karunganni	..	..	..	..	..	1	1	1	1	1
Tinnevellies	..	..	..	..	..	..	..	..	..	..
Cambodia (Coimbatore No. 2)	..	..	..	..	..	2	1	1	4	3
Cambodia (Unspecified)	..	..	..	..	..					2
Salems (Uppam)	..	..	..	..	..	..	..	..	..	..
Unclassified	..	..	..	..	..	..	1	..	2	..
Total	..	..	..	..	..	44	39	30	42	45
Comillas	..	..	..	..	..	..	..	..	..	..
Burmas	..	..	..	..	..	..	..	..	..	..
Other sorts	..	..	..	..	..	..	..	2	..	..
Total Indian Cotton	25	24	18	33	29	45	41	36	43	53
Americans	..	..	..	..	..	..	..	..	2	1
Egyptians	..	..	..	..	..					..
East Africans	..	..	..	..	..					..
Others (Sudan, Mesopotamia, etc.)	..	..	..	..	..					2
Total Foreign Cotton	..	..	..	..	..	..	..	..	2	3
Grand Total	25	24	18	33	29	45	41	36	45	56
Indian Raw cotton Consumed in Indian Mills (Figures compiled mainly from returns under the Indian Cotton Cess Act.)	19	21	23	31	33	40	47	43	49	51

COTTON CLASSIFIED BY VARIETIES—*contd.*

400 lbs. each).

MILLS IN

Baroda.					Gwalior.					Indore.				
1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
..	..	..	..	..	..	..	..	..	5	..	..	..	..	..
..	..	..	..	..	..	..	..	..	5	..	..	..	..	..
..	1	2	..	..	..	..	..	..	..	2	1	1	..	1
..	..	..	..	..	10	16	9	..	..	..	..	..	..	..
..	1	2	..	..	10	16	9	..	10	2	1	..	..	1
3	..	1	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
2	4	3	3	3	25	22	30	9	20	67	41	78	60	49
..	..	..	..	..	..	..	..	..	..	..	..	4	..	..
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	4	4	3	4	25	22	30	9	20	67	41	82	61	49
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	1	1	3	3	..	..
..	..	..	..	..	..	..	..	..	1	1	3	3	..	..
..	1	..	..	..	2	2	1	..	1	2	..	..	1	..
..	..	..	..	..	..	..	..	..	6	..	..	..	..	..
..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	1	..	..	1	2	2	1	..	7	2	..	..	1	..
7	13	9	7	10	..	1	1	..	..	1	2	2	1	1
9	8	8	6	11	..	..	..	..	..	..	..	..	10	3
16	21	17	13	21	..	1	1	..	..	1	2	2	11	4
..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
2	6	5	5	6	..	..	..	..	..	..	..	..	3	3
2	6	6	5	6	..	..	..	..	..	..	..	..	3	3
..	..	..	..	..	..	..	..	1	..	3	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	1	..	..	..	..	..	..	..	..	..	1	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1	1	..	..	..	..	..	..	..	..	1	..	..	..	..
..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
1	2	..	1	1	..	..	..	1	..	4	1	..	1	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	2	..	..	2	..	..	..	..	..	..	8	8	..	..
25	37	29	22	35	37	41	41	10	38	77	56	96	77	57
2	4	2	11	..	..	1	..	..	..	..	5	..	3	..
				1										
				11										
				2										
2	4	2	11	14	..	1	..	..	..	..	5	..	3	..
27	41	31	33	49	37	42	41	10	38	77	61	96	80	57
49	59	63	59	51	37	41	45	46	43	76	83	89	95	91

RECEIPTS AT MILLS IN INDIA OF RAW

(In thousand bales of

Trade Descriptions of Cotton.	RECEIPTS AT KATHIAWAR STATES.					RECEIPTS AT OTHER INDIAN STATES.				
	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
BENGALS—										
United Provinces	..	..	..	..	..	..	1	1	3	..
Sind-Punjab	..	..	..	..	..	..	..	..	..	..
Rajputana	..	..	..	..	..	1	..	..	..	6
Others (Unclassified)	..	..	..	..	..	..	1	..	..	..
Total	..	..	..	..	..	1	2	1	3	6
OOMRAS—										
Central Provinces	..	..	..	..	..	3	2	1	1	3
Berar	..	..	..	..	..	1	1	..	3	2
Khandesh	..	..	..	..	..	..	..	5	..	..
Central India	..	..	..	..	..	2	2	2	6	6
Barsi and Nagar	..	..	..	..	..	..	..	..	..	..
Unclassified	..	..	..	..	..	1	5	2	..	..
Total	..	..	..	..	..	7	10	10	10	11
VERUM 262	..	..	..	..	..	..	..	..	..	..
HYDERABAD GAORANI	..	..	..	..	..	..	6	2	..	..
Total	..	..	..	..	..	..	6	2	..	..
AMERICANS—										
Punjab—289-F	..	..	..	..	..	4	1	3	4	..
Punjab (Unspecified—4-F)	..	..	..	..	..					4
Sind	..	..	..	..	..	1	1	..	..	..
Dharwar (Gadag 1)	..	..	..	..	..	..	..	..	..	..
Dharwar (Upland—Unspecified)	..	..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	5	2	3	4	4
BROACH—										
Surat-Navsari	2	3	3	..	2	..	..	1	..	2
Broach (Unspecified)	1	3	1	..	..	..	1	6	8	4
Total	3	6	4	..	2	..	1	7	8	6
DHOLLERAS—										
Mattheo	..	1	1	1	3	..	..	..	..	..
Dholleras (Unspecified)	6	5	10	7	8	..	..	1	3	1
Total	6	6	11	8	11	..	..	1	3	1
SOUTHERNS—										
Kumptas (Jayawant)	1	..	..	..	..	3	6	2	2	..
Kumptas (Unspecified)										2
Westerns	..	..	..	..	..	1	7	..	3	..
Northerns	..	..	..	..	..	..	5	..	..	..
Coconadas	..	..	..	..	..	..	..	..	..	..
Karunganni	..	..	..	..	..	..	..	..	1	2
Tinnevellies	..	..	..	..	..	..	..	..	..	..
Cambodia (Coimbatore No. 2)	1	..	..	..	..	3	5	1	1	..
Cambodia (Unspecified)										2
Salems (Uppam)	..	..	..	..	..	..	..	..	..	..
Unclassified	..	..	..	..	..	..	..	..	..	..
Total	2	..	..	..	..	7	23	3	7	6
COMILLAS	..	..	..	..	..	..	..	..	..	..
BURMAS	..	..	..	..	..	..	..	..	..	..
OTHER SORTS	..	..	..	..	..	1	..	..	..	2
Total Indian Cotton	11	12	15	8	13	21	44	27	35	36
AMERICANS										
EGYPTIANS										
EAST AFRICANS	..	..	..	2	3	..	1	..	1	1
OTHERS (Sudan, Mesopotamia, etc.)										
Total Foreign Cotton	..	..	..	2	3	..	1	..	1	1
Grand Total	11	12	15	10	16	21	45	27	36	37
Indian Raw Cotton consumed in Indian Mills (Figures compiled mainly from returns under the Indian Cotton Cess Act).	(a)	(a)	20	19	19	(b)57	(b)64)	33	40	40

(a) Included under "Other Indian States."

(b) Includes "Kathiawar States" and "Pondicherry."

COTTON CLASSIFIED BY VARIETIES—*concld.*

400 lbs. each)

MILLS IN PONDICHERRY.					TOTAL INDIAN STATES.					GRAND TOTAL.				
1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.
..	..	..	..	..	..	1	1	3	5	82	129	137	121	129
..	..	..	..	..	..	..	..	..	5	36	51	62	39	43
..	..	..	..	..	3	2	3	..	7	18	23	28	55	42
..	..	..	..	..	10	17	9	..	..	35	54	24	17	18
..	..	..	..	..	13	20	13	3	17	171	257	251	232	232
..	..	..	..	..	6	2	2	2	6	107	118	125	85	101
..	..	..	..	..	1	1	..	4	2	78	84	76	72	54
..	..	..	..	..	..	..	5	..	1	45	44	52	36	49
..	1	..	..	..	96	71	115	78	78	190	181	234	131	131
..	..	..	..	..	11	9	11	5	6	53	32	36	21	25
1	..	..	..	..	3	5	2	1	..	27	40	29	16	..
1	1	..	..	..	117	88	135	90	93	500	499	552	361	360
..	..	..	..	..	..	..	..	..	..	..	..	..	..	25
..	..	..	..	..	14	24	17	26	23	136	172	128	80	131
..	..	..	..	..	14	24	17	26	23	136	172	128	80	156
..	..	1	3	5	10	5	5	9	2	53	87	112	196	15
..	..	4	3	3	1	1	4	3	19	5	10	18	13	162
..	..	..	..	..	..	..	..	..	3	9	14	8	7	20
..	..	..	..	1	..	..	..	..	1					10
									2					25
..	..	5	6	9	11	6	9	12	27	67	111	138	216	232
..	..	1	1	..	10	19	17	9	15	98	156	161	94	165
2	4	5	3	2	12	16	20	27	20	85	110	126	247	199
2	4	6	4	2	22	35	37	36	35	183	266	287	341	364
..	..	..	..	..	..	1	3	1	3	15	5	21	41	32
..	..	..	..	..	8	11	16	18	18	83	102	112	161	114
..	..	..	..	..	8	12	19	19	21	98	107	133	202	146
..	..	..	..	..	22	22	17	18	1	142	166	123	122	34
..	..	..	..	1					18					111
6	8	5	6	6	26	31	17	24	24	93	121	111	108	116
..	..	..	..	..	7	10	1	6	5	31	41	19	33	18
2	2	..	4	4	2	3	..	4	4	7	10	3	11	12
..	..	..	..	..	1	1	1	2	3	41	40	44	51	54
..	..	..	..	..	..	..	..	..	..	53	51	47	51	56
2	3	3	3	..	10	10	5	8	3	107	112	98	108	67
				3					8					74
..	3	1	..	..	..	3	.. 1	..	..	3	6	4	3	4
4	..	..	..	..	4	1	..	3	..	31	41	9	28	..
14	16	9	13	14	72	81	42	65	66	508	588	458	515	546
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	6	9	10	..	8
..	..	..	..	..	1	10	10	..	4	7	19	16	4	21
17	21	20	23	25	258	276	282	251	286	1,676	2,028	1,973	1,951	2,065
..	..	..	..	1					2					84
..	..	..	..	..					1					36
..	..	..	..	..	2	11	2	19	15	59	114	273	461	184
									4					26
..	..	..	..	..										
..	..	..	..	1	2	11	2	19	22	59	114	273	461	330
17	21	20	23	26	260	287	284	270	308	1,735	2,142	2,246	2,412	2,395
(a)	(a)	18	20	23	278	315	334	359	351	1,992	2,373	2,269	2,346	2,360

(a) Included under "Other Indian States."

APPENDIX

EXPORTS BY SEA OF INDIAN COTTON

(COMPILED FROM VOLUNTARY

Cotton Year : 1st September

(In thousand bales of

N.B.—Due to corrections received since the statistics for the seasons 1928-29 to 1931-32 were revised figures.

Trade Descriptions of Cotton.	JAPAN AND THE EAST.					EUROPE AND		
	1928–29	1929–30	1930–31	1931–32	1932–33	1928–29	1929–30	1930–31
BENGALS—								
United Provinces	31	26	17	9	7	37	53	36
Sind-Punjab	114	191	160	171	227	115	125	118
Rajputana	1	3	2	..	4	3	6	..
Unclassified	54	81	65	40	1	193	278	159
Total ..	200	301	244	220	239	348	462	313
OOMRAS—								
Central Provinces	135	100	127	68	115	38	54	50
Berar	217	201	233	202	276	108	114	66
Khandesh	143	135	142	109	162	127	105	56
Central India	134	139	146	60	96	26	40	12
Barsi and Nagar	52	62	34	42	46	10	14	6
Unclassified	155	199	245	12	95	252	202	131
Total ..	836	836	927	493	790	561	529	321
VERUM 262	..	..	..	..	..	..	..	..
HYDERABAD GAORANI	34	47	20	6	7	10	7	4
Total ..	34	47	20	6	7	10	7	4
AMERICANS—								
Punjab—289-F	..	..	..	..	1	..	..	..
Punjab (Unspecified—4-F) ..	154	209	255	43	141	95	105	77
Sind	2	..	5	3	29	6	8	10
Dharwar (Gadag 1)	..	..	..	..	..	..	..	..
Dharwar (Upland—Unspecified)	12	6	1	..	7	..	1	..
Total ..	168	215	261	46	178	101	114	87
BROACH—								
Surat-Navsari	..	6	4	6	1	..	4	..
Broach (Unspecified) ..	48	84	62	29	76	14	14	12
Total ..	48	90	66	35	77	14	18	12
DHOLLERAS—								
Mattheo	11	14	18	16	28	26	19	9
Dholleras (Unspecified) ..	62	31	99	14	151	2	7	..
Total ..	73	45	117	30	179	28	26	9
SOUTHERNS—								
Kumptas (Jayawant) ..	..	..	..	..	..	..	..	..
Kumptas (Unspecified) ..	2	1	..	..	1	2	2	1
Westerns	9	17	13	1	17	47	47	28
Northerns	..	..	..	..	5	4	3	2
Coconadas	2	1	14	3	4	26	37	28
Karunganni	14	10	3	..	..	2	5	..
Tinnevellies	36	13	20	7	19	10	13	3
Cambodia (Coimbatore No. 2)	..	..	..	..	..	..	..	..
Cambodia (Unspecified) ..	9	5	8	1	1	5	8	2
Salems (Uppam)	..	..	..	..	2	1	1	..
Total ..	72	47	58	12	49	97	116	64
COMILLAS	..	..	..	1	2	13	15	15
BURMAS	3	20	24	6	16	..	..	..
OTHER SORTS	..	..	..	..	2	..	..	..
Total Indian Cotton ..	1,434	1,601	1,717	849	1,539	1,172	1,287	825
Exports as per Director-General of Commercial Intelligence and Statistics' statistics ..	2,178	1,964	2,379	1,000	1,596*	1,429	1,515	1,003
	(Japan and China.)					(Europe excluding U.		

* Provisional.

VIII.

CLASSIFIED BY VARIETIES.

RETURNS FURNISHED BY EXPORTERS.)

to 31st August.

400 lbs. each.)

first published in August 1933, some of the figures given in this table for these seasons are

THE WEST.		UNITED KINGDOM.					TOTAL.				
1931–32	1932–33	1928–29	1929–30	1930–31	1931–32	1932–33	1928–29	1929–30	1930–31	1931–32	1932–33
23	14	2	5	15	21	2	70	84	68	53	23
132	330	10	9	20	26	40	239	325	298	329	597
2	5	..	..	..	..	1	4	9	2	2	10
49	37	10	10	45	3	12	257	369	269	92	50
206	386	22	24	80	50	55	570	787	637	476	680
13	37	11	21	26	13	22	184	175	203	94	174
21	52	9	11	7	1	3	334	326	306	224	331
16	57	1	1	1	..	2	271	241	199	125	221
4	20	1	..	2	..	..	161	179	160	64	116
2	16	..	..	1	1	1	62	76	41	45	63
7	42	14	22	13	..	6	421	423	389	19	143
63	224	36	55	50	15	34	1,433	1,420	1,298	571	1,048
..	..	..	..	..	..	..	..	..	..	..	..
1	1	..	..	..	..	..	44	54	24	7	8
1	1	..	..	..	..	..	44	54	24	7	8
..	..	..	..	..	..	1	..	..	..	..	2
19	51	79	105	86	31	66	328	419	418	93	258
2	5	2	9	19	4	8	10	17	34	9	42
..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	1	12	7	1	..	8
21	56	81	114	105	35	76	350	443	453	102	310
..	4	..	1	..	..	2	..	11	4	6	7
5	44	7	5	3	1	14	69	103	77	35	134
5	48	7	6	3	1	16	69	114	81	41	141
12	56	..	..	..	..	..	37	33	27	28	84
1	22	..	3	..	..	1	64	41	99	15	174
13	78	..	3	..	..	1	101	74	126	43	258
..	..	..	..	..	..	..	..	..	..	..	..
..	2	..	..	..	..	1	4	3	1	..	4
9	51	4	6	1	..	1	60	70	42	10	69
1	5	1	..	..	..	..	5	3	2	1	10
6	29	7	9	5	7	12	35	47	47	16	45
..	6	1	3	..	..	4	17	18	3	..	10
..	7	8	5	1	1	9	54	31	24	8	35
..	..	..	..	..	..	1	..	..	..	..	1
..	..	7	6	..	..	..	21	19	10	1	1
..	..	3	1	..	..	..	4	2	..	..	2
16	100	31	30	7	8	28	200	193	129	36	177
18	25	4	2	2	2	3	17	17	17	21	30
..	..	..	1	..	..	..	3	21	24	6	16
..	1	..	..	..	..	..	..	..	..	..	3
343	919	181	235	247	111	213	2,787	3,123	2,789	1,303	2,671
424	862*	233	286	274	125	242*	3,933	3,868	3,729	1,582	2,741
Kingdom.)		(United Kingdom.)					(Totals including "Other Countries" as follows:— 93	103	73	33	41*)

APPENDIX IX.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *The Broach Tract.*—The policy of growing 1027 *A.L.F.* in the Surat-Broach area lying south of the river Narmada was continued and 607,176 lbs. of seed was distributed to the cultivators in the British districts by opening 20 seed depots financed from the subsidy granted by the Indian Central Cotton Committee, Bombay. In addition 1,778,258 lbs. of 1027 *A.L.F.* seed was supplied to the States of Rajpipla, Chhota Udepur, Jambughoda, Baroda and Cambay. The Department controlled 13,527 acres for seed multiplication in four groups of villages of which 4,328 acres in Bardoli Taluka were managed from the funds of the Indian Central Cotton Committee.

Certain Co-operative Sale Societies, whose preference and propaganda have been for selection *I.A*, experienced some difficulty in selling their produce which was poorer than Selection *I.A.* in quality and accordingly they have purchased 250 gallies or 285,000. lbs. of 1027 *A.L.F.* for their members.

(2) *The Khandesh Tract.*—The improved type of cotton called *Banilla* is now well established in Khandesh. The demand from the mills is increasing and the cultivators realise the value of pure seed.

The total area under *Banilla* cotton during 1932-33 is estimated at about 100,000 acres with an average yield of 85 lbs. of lint per acre and a total outturn of about 23,000 bales. Owing to deficiency of moisture in the late stage of growth the ginning percentage was affected and was on an average 37 per cent., i.e., about 2 per cent. less than normal. The quality of cotton was, however, generally satisfactory. *Banilla* cotton grown by cultivators from seed distributed by the Department fetched on an average a premium of Rs. 13 per candy over local cotton and Rs. 17 per candy over *Oomra.*

The seed multiplication scheme financed by the Indian Central Cotton Committee reached its second year during 1932-33. Owing to the failure of the cotton crop during 1931-32 the quantity of pedigree seed obtained was small and during 1932-33 only 4,460 acres of "Reserved Area" could be organised. From this area about 600,000 lbs. of pure seed was obtained.

(3) *The Kumpta Dharwar Tract.*—The work of introducing two improved varieties of cotton, viz., *Jayawant* and *Gadag No.* 1 was carried out on an extensive scale through the Hubli and Gadag Cotton Sale Societies with the aid of funds from the Indian Central Cotton Committee. For multiplying pure pedigree seed of these two varieties, blocks of reserved areas were organised as usual. The reserved area under *Jayawant* cotton at the Hubli centre was 15,109 and that under *Gadag No.* 1 at the Gadag centre 22,130 acres against 17,640 acres and 22,514 acres respectively of last year. The cotton crop was below normal owing to adverse climatic conditions. The quantity of seed cotton received by the Hubli and Gadag Sale Societies from these reserved areas were 4,033 *dokras* (1,355,088 lbs.) of *Jayawant* and 2,790 *dokras* (937,440 lbs.) of *Gadag No.* 1 and seed produced therefrom were 886,422 lbs. and 650,000 lbs., sufficient to cover 88,000 acres and 65,000 acres respectively with fresh seed during the coming season.

With a view to spread *Jayawant* cotton in other areas, separate seed multiplication blocks of 1,100 acres at Athani with the help of the funds from the Indian Central Cotton Committee and 1,000 acres at Haveri and 400 acres at Bijapur through the help of the local Cotton Sale Societies were formed.

For the distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed depots were opened as usual in different selected centres. The general area grown with pure seed was 53,481 acres under *Jayawant* and 31,970 acres under *Gadag No.* 1 against 78,119 acres and 98,918 acres respectively of last year and the estimated

yield was 5,567 bales of *Jayawant* and 3,200 bales of *Gadag No.* 1 against 10,000 bales and 13,500 bales respectivley of last year.

Besides the above, the Hubli Cotton Sale Society has sent about 4 lakhs lbs. seed, sufficient for 40,000 acres, outside the area of its operation. The total area under *Jayawant* cotton with pure seed therefore was 108,590 acres. The Gadag Sale Society stocked in all 1,244,601 lbs. pure *Gadag No.* 1 cotton seed, sufficient for an area of 124,461 acres, and distributed 541,057 lbs., sufficient for 54,484 acres.

Both *Jayawant* and *Gadag No.* 1 continued to be appreciated by the buyers who gave on an average Rs. 13 more per *naga* of seed cotton (1344 lbs.) for *Jayawant* and Rs. 20 per *naga* more for *Gadag No.* 1 in auction sales held at Hubli and Gadag respectively over the local cotton against Rs. 7 and Rs. 15 per *naga* of last year.

MADRAS.—*I. The Southerns Tract*— (*a*) *Cambodia-Coimbatore.*—(*i*) The multiplication of pure *Co.* 2 seed for distribution to cultivators continued as in previous years. The seed farms with each individual *ryot* as a unit like the area in Annur centre in the previous year were discontinued and the entire area was arranged by contract with limited liability societies. 998 acres were thus arranged with four societies in Tirupur and Coimbatore centres as compared to 973 acres with 3 societies and 72 members in the preceding year. The Tirupur Co-operative Trading Society had 1,974½ acres with 18 societies in Avanashi and Tirupur centres as against 725 acres with 11 societies in Avanashi alone in the previous year (1931-32). The total seed farm area in the 1932-33 season was 2,972½ acres.

(*ii*) It is estimated that an area of 40,000 acres was under *Co.* 2 cotton produced by :—

(*a*) the Agricultural Department,

(*b*) the Tirupur Co-operative Trading Society, and

(c) a few *ryots* in Gobichettipalayam and Pollachi, who did co-operative ginning.

(*iii*) In addition, 22,085 lbs. of pure seed, to cover an area of about 1,000 acres, was supplied to other districts in the Presidency.

(*iv*) The yield of lint from the 1931-32 seed farms was 452½ *candies*. An average price of Rs. 152 per *candy* of 500 lbs. was realised which was Rs. 10 more than the ruling market rate at the time of sale. *Co.* 2 lint has established a reputation for itself and is therefore in large demand.

(*v*) During the coming season (1933-34) an area of 1,000 acres of seed farms will be under the supervision of the Agricultural Department. It is expected that the Tirupur Co-operative Trading Society will arrange for 4,000 acres. The Department has at present a stock of 353,500 lbs. of *Co.* 2 seed obtained from the 1932-33 seed farms and a quantity of 496,500 lbs. of seed are available with the Tirupur Co-operative Trading Society, for distribution. These together with the stocks of pure seed held by *ryots* who did co-operative ginning will still further increase the area under this improved variety; there are already indications in this direction.

Cambodia-Trichinopoly.—In the Trichinopoly District, an amount of 9,075 lbs. of *Co.* 2 *Cambodia* seed as compared to 7,050 lbs. in the previous year was distributed. This will cover an area of nearly 907 acres.

Cambodia-Madura.—The area under *Co.* 2 seed farms was 105 acres as against 130 acres in the previous year. The total area under *Cambodia*, dry and irrigated, is estimated at 79,161 acres, the bulk of which is *Co.* 2.

(*b*) *Karunganni-Coimbatore.*—The *C.* 7 *Karunganni* strain of the Tinnevelly tract has become extremely popular in Coimbatore to the extinction of large *Uppam* areas. The propagation of this strain through seed farms similar to those for *Cambodia* was

continued. The seed farm area during the year under report was 830 acres in Coimbatore and Udumalpet taluks as against 790·70 in the 1931-32 season. An amount of 116,677 lbs. of *Karunganni* seed was distributed among cultivators who also obtained seed from the Koilpatti tract. It is estimated that this strain will occupy an of area 14,500 acres as compared to 8,200 acres in the previous year. The seed farm lint commands a premium of Rs. 5 per *candy* of 500 lbs. in the market.

Karunganni—South.—The multiplication of standard strains of *C.*7 and *A.*10 was continued on the lines of last year. The advance to seed farm *ryots* for cultivation expenses was reduced from Rs. 5 to Rs. 3 per acre during the year. The area under seed farms increased from 707 acres in 1931-32 to 939 acres in 1932-33.

The total quantity of seed obtained from seed farms was 11,753 lbs. as compared to 63,833 lbs. obtained from the seed farms of 1930-31. The demand for this seed was greater than the supply. The improved demand is due to better price for this cotton as compared to other produce. The yield also is greater than that of *Uppam.*

II. *Northerns and Westerns Tract*—(*a*) *Northerns.*—No. 14 is the improved strain for the locality though it is not suited to the stiff black soils in the tract, especially when the rainfall is anything less than 30 inches. The total area under seed-farms was 2,445 acres as against 1,804 acres in the previous year. A total quantity of 789,53 lbs. of seed was produced in these seed farms and were sold to the *ryots*; the quantity distributed during the previous year was 88,530 lbs. It is estimated that the total area sown to *N.* 14 was 10,548 acres as compared to 27,815 acres in the previous year.

97 bales of lint (1 bale equals 400 lbs.) of *N.* 14 were sold through the departmental agency at a premium of Rs. 15 per bale as compared to a premium of over Rs. 25 per bale in the previous year.

(*b*) *Westerns.*—*H.* 1 strain evolved at the Agricultural Research Station, Hagari, is the improved strain. The area grown under seed-farm conditions was 3,638 as against 2,748 acres in the previous year. A total quantity of 190,588 lbs. of seed was distributed by the Department out of the produce obtained from the seed farms. Owing to the exceptionally bad season, the quantity of seed distributed among the *ryots* themselves was low, the bulk of the produce having been retained for feeding cattle.

The total area under *H.* 1 strain in the Westerns tract is estimated to be about 184,709 acres as against 171,815 acres in the previous year. Owing to ill-distributed rainfall, the yield of *kapas* is estimated at about 35 lbs. an acre as against 90 lbs. in the previous year.

By co-operative marketing, about 140 bales of lint of 400 lbs. each were sold through the agency of the Agricultural Department at a premium of Rs. 6-8-0 per bale over the market rate, as against a premium of Rs. 10 to Rs. 15 in the previous year.

United Provinces—*C.* 520.—In the year under report full attention was paid to the expansion of the area under this cotton which, being higher yielder and decidedly superior to *A.* 19 in fibre, has already gained popularity among cotton growers, but insufficiency of its stock compelled the distribution of *A.* 19 in order to cope with the heavy demand of seed. The total quantities of *C.* 520 and *A.* 19 cotton seeds distributed during the year from the departmental and its associated private agencies amounted to 805 maunds and 1,403 maunds representing areas as sown by seed store agencies under these varieties as 6,175 and 27,289 acres respectively.

C. 520 was isolated as a result of a short survey of the botanical types conducted in the upper portions of the Gangetic plain in Saharanpur and Bijnor districts in 1919 and 1920. This is an early-flowering, medium-stapled, high-ginning and high-yielding cotton which the average grower in the main cotton tract would like to take up without any consideration of staple and quality. This strain was not at first pushed forward in the irrigated areas as it was originally evolved in order to meet the demands of an improved strain in tracts, where the facilities for irrigation do not exist, and the cotton area is sown

on the break of monsoon only. Arrangements for regular trials of rain-sown areas has been started this year.

C. 402.—This strain spins 16-20's counts and gives a high ginning percentage of 38 and this character makes it a valuable cotton for ginners and traders as well. As all long-staple cottons tend to be rather late in their maturation period *C.* 402 requires to be sown early by means of artificial irrigation. Therefore it can only be taken up in canal-irrigated tracts of the United Provinces. With the opening of the Sarda Canal a new tract comprising Unao, Hardoi and portion of Lucknow and Sitapur districts, where cotton can be grown, is being tried for its introduction. The cultivators have no experience of cotton cultivation with irrigation in these parts and attempts are being made by the Deputy Directors of Agriculture to explain the methods and advantages of cotton sowings with canal irrigation. In 1932-33 the area under *C.* 402 increased and there was keen competition in cotton purchase between the Co-operative Society purchasers and the local traders. 3,416 maunds of cotton was purchased and offered in the Cawnpore market for sale. As the cotton prices began to fall cotton bales could not be sold till very late in the season, with some losses. This is the first year in which losses had to be borne during the last 4 or 5 years. Methods of marketing of this cotton require to be developed and as the area increases the produce will find some channel to reach the consumers. Cultivators have realized that this is a cotton which can bring them more money.

THE PUNJAB.—The total area under *American* cotton in British districts was 776,230 acres as compared with 763,000 acres in the preceding year. Of this 4*F* was grown on 709,120 acres, whilst 289*F*—the other later selection—was reported to have been grown on 30,900 acres.

2. The total area under *Desi* cottons in the province (excluding States) was 1,113,160 acres as against 1,396,700 acres during the preceding year. *Mollisoni*—a selection of the *Indicum* variety—was grown on 510,080 acres whilst a type of improved *Roseum* was grown on 78,820 acres.

3. At Lyallpur work continued on the selection of types of both *American* and *Desi* cottons with a view to produce improved strains.

CENTRAL PROVINCES AND BERAR.—The chief feature of the year was the confirmation of the results obtained the previous season, demonstrating the superiority of the late *Verum* over all other types of cotton tried. The distribution of the multiplication area was such as enabled a large number of growers to see this strain growing under field conditions and the enthusiasm it has caused among them is reflected in the applications for seed for the coming season. It has not been possible to meet more than a mere fraction of this demand but some 10,000 lbs. of seed has been distributed by departmental agency for growing in suitable areas and this combined with seed from other sources should ensure over 10,000 acres under it in the coming season. The quality of lint of this cotton is superior to that of *Verum* 262 and it is especially recommended for growing in areas where the monsoon lasts till rather late in the season. From its yarn strength results this year it has been adjudged suitable for spinning up to 31's standard warp counts.

Among the newer selections from *G. N. Verum*, *V.* 434 deserves a mention as being exceptionally promising and one which is likely to form definite improvement on *Verum* 262, which observations and studies during the past 3 or 4 years have shown to be highly susceptible to variations in climatic conditions which render estimation of its cropping power a difficult matter owing to wide fluctuations in yield from year to year. The chief merit of *V.* 434 lies in its adaptability to varying conditions of soil and climate and it is anticipated that it will prove to be a suitable substitute for *Verum* 262 in areas for which late *Verum* is not recommended.

Work on *Bani* has yielded two strains, viz., *Bani* 306 and *E. B.* 31 which were tested in suitable areas and gave very satisfactory results in respect of yield. In spinning qualities *Bani* 306 is superior to *E. B.* 31. With a staple length of 1 inch it has been adjudged suitable for spinning up to 43's highest standard warp counts as against 39's in the case of *E. B.* 31.

BURMA—1. *West Central Circle.*—In the West Central Circle this crop is of importance only in Thayetmyo district where it is grown as a mixed crop with sesamum or with taung-ya paddy. Its area there was 35,000 acres.

Experimental work on cotton was limited to the Allanmyo Farm. Trials of exotics have been almost given up. *Co.* 1 (0·95 acre) and *Broach* (1·50 acres) were the only ones grown and in the case of the latter this has been retained for crossing work only.

From the Wagale strains, on the performances of the past 4 years, *T*74 is being discarded, *D*1/*EB* is being continued in an observation plot, and *T*80 and *T*83 are being put forward for multiplication.

From the Wagyi strains *M. W.* (800-*C*465) is being put forward for multiplication. Trials with the remaining three strains will be continued.

2. *Myingyan Circle.*—The partial failure of the crop in 1931 resulted in a smaller quantity of improved cotton seed being available for distribution. There was an area of 2,026 acres under improved strains, 1,311 acres being seeded with the pwinbyu strain and 715 acres with the re-selected *C*19 strain. The ginning outturn of the latter is somewhat lower at 38·5 per cent. (42 per cent.) but as the outturn of the Wagale crop did not average more than 30 per cent. in the year of report the improvement in the outturn of ginned cotton is well maintained. The total quantity of *kapas* ginned at the Mahlaing farm ginnery was 150,474 viss and 88,127 viss of seeds are available for distribution in the coming year. The cultivators' demand for the Department's improved cotton seed has always been in excess of the supply. Extension of the crop has been limited by high seed rates, low average yields and adverse seasonal conditions. The gradual extension of drill sowing and other improved methods which are calculated to reduce the seed rate by 50 per cent. and to increase the yield by anything from 50 to 100 per cent. will do much to relieve the situation. The output of the Mahlaing Farm ginnery this year is sufficient to seed 8,500 drill-sown acres which at an average yield of 150 viss per acre would provide sufficient seed for 76,500 drill-sown acres in the following year. Under existing conditions the stock of improved seed this year is expected to seed approximately 5,700 acres of which 3,000 acres may be drill sown.

At the Mahlaing Experimental Station the improved *C*19 white-flowered strain was again yield-tested against the hybrid strain *LII* × *W*6 and two mixtures of pure strains. Although the results did not satisfy the *Z* test, the trial again indicates the superiority of the *C*19 strain in the outturn of ginned cotton.

HYDERABAD STATE—1. *Gaorani Tract.*—Distribution of *Gaorani* seed in the protected area was continued on the same lines as last year. 3,013,440 lbs. of seed, for an area of about 167,413 acres, was purchased by the Agricultural Department and distributed on *Tacavi* loan system to cultivators in the Nanded district.

2. *Aurangabad District.*—Distribution of *Banilla* cotton seed was continued with a view to replace the mixture now grown in the district. 28,500 lbs. of seed, sufficient for about 1,800 acres, was distributed by the Agricultural Department on *Tacavi* system.

3. *Raichur District.*—Distribution of seed of improved varieties was continued with a view to replace the local inferior type of *Kumpta* and the mixed Dharwar-American. 303,924 lbs. of seed of *Jayawant* sufficient for about 25,000 acres and 42,786 lbs. of seed of *Upland Gadag No.* 1, sufficient for about 3,000 acres, were purchased from the Cotton Sale Societies of Hubli and Gadag and distributed on *Tacavi* loan system.

BARODA STATE—1. *Navsari District.*—The main work in this crop consists in extension of the strain of 1027 *A.L.F.* to replace the deteriorated local mixed seed. This is done through registered pure seed growers, joint sale societies and departmental seed stores. During the year these seed depots supplied 118,560 lbs. of pure seed of 1027 *A.L.F.*

2. *Baroda District.*—The departmental distribution of pure seed of *Broach* 9 strain, to help in its extension, amounted to 2,480 lbs. during the year. Besides this, a considerable distribution took place through unofficial channels by growers themselves.

3. *Mehsana District.*—The selection *Wagad* 8 continues to be in demand to take the place of the local mixture. 2,200 lbs. of seed of this strain was supplied mainly through Co-operative Societies. Tests with 1027 *A.L.F.* and *Broach* 9 types are being continued.

4. *Amreli District.*—The extension of *Dhulia No.* 1 strain, of proved superiority over the local *Mathio*, continued to be encouraged by making available 15,600 lbs. of seed departmentally.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety s grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, (2) by the Cotton Transport Act which prohibits and penalizes the sowing or importing into the State for purposes of sowing of *Goghari* cotton seed or any other short-staple seed, and (3) by the control of ginning and pressing factories.

The best seed of 1027 *A.L.F.* was (as usual) secured by deputing an experienced Thandar with some leading cultivators of the State, who purchased it with the assistance and guidance of the Cotton Superintendent, Surat. The liberal policy of distributing the seed thus obtained by way of *Takavi* to the cultivators of the State from different convenient depots is continued from year to year and this practice has tended to raise the outturn and the quality of cotton to all that could be desired.

Another great advantage of this measure to the cultivators is that whereas in the past, when the short-staple *Goghari* cotton was cultivated here in the State, they were required to go some forty and fifty miles, and at times still further away from their houses into British districts to sell their cotton, now through the introduction of this measure and the success it has achieved they have found a ready market at their own doors; and there is such a demand for it that even in these years of heavy depression, this cotton is readily sold at comparatively good prices.

Besides this measure has stimulated the growth of meetings for the sale of the cotton crop to the highest customer at various agricultural centres in the State; and this has resulted in cultivating a spirit of combination in the cultivators to dispose of their agricultural produce at the best prices available.

Rajpipla cotton is now recognized as equal to the very best cotton and is largely sought after.

APPENDIX X.

BALANCE SHEET AS AT MARCH 31ST, 1933.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		85,24,890 15 11	I. A. Administration		13,18,030 12 1
INTEREST ACCOUNT—			B. Improvement of Cotton Marketing		81,077 5 10
Amount received on Investments	12,11,629 10 3		C. *Seed Distribution and Extension Schemes*—		
Add—Refund of income-tax deducted from interest	15,745 3 0		1. Hubli	17,628 15 0	
	12,27,374 13 3		2. Gadag	19,623 8 10	
Less—Interest paid in advance at the time of purchasing Government Paper (since recovered), Interest on temporary over draft and Bank's commission for collection of interest	43,012 15 5		3. Gadag Supplementary	11,264 1 10	
Interest credited to Provident Fund Account	4,886 6 2		4. Khandesh	62,626 15 6	
Bank's withdrawal charges for securities sold	2,361 1 0		5. Surat	20,279 13 10	
Income-tax deducted on interest	18,972 15 10		6. Hyderabad	12,675 14 5	
Brokerage for sterling loan sold	291 9 0		7. Madras	5,254 13 0	
Provision for Sinking Fund	3,672 2 0		8. Madras Co. 2	1,345 13 0	
	73,197 1 5		9. Sind	49,794 14 0	
		11,54,177 11 10	10. Athani	1,940 0 0	
Profit on conversion and sale of securities		53,671 12 7	11. Central Provinces	53,016 4 5	
Sinking Fund Account		3,672 2 0	12. Lyallpur ginnery	18,125 0 0	
Miscellaneous receipts		18,024 0 7			2,73,576 1 10
			D. *Printing and Propaganda*—		
			1. Publicity and Propaganda	15,159 4 3	
			2. Printing and Distribution	15,422 1 3	
					30,581 5 6
			II. *Technological Research*—		
			(1) Technological Laboratory—		
			A. Capital Expenditure—		
			1. Land and Buildings	3,55,797 9 11	
			2. Machinery	85,019 6 1	
			3. Freight	7,502 2 8	
			4. Apparatus and equipment	41,558 3 7	
			5. Machinery Workshop	5,789 3 3	
			B. Working Expenses	12,04,240 2 7	
			(2) Provincial	39,072 15 3	
					17,38,980 0 4
			III. Research Studentships		2,06,360 10 8
			AGRICULTURAL RESEARCH GRANTS.		
			IV. *Bombay Schemes*—		
			1. Surat Physiological	2,44,705 6 3	
			2. A. Surat Boll-worm	1,14,509 9 7	
			B. Surat Boll-worm Propaganda	61,958 14 0	
			C. Do. do. Writing-up Scheme	2,420 0 0	
Carried over		97,54,436 10 11	Carried over	4,23,593 13 10	36,48,606 4 3

BALANCE SHEET AS AT MARCH 31ST, 1933—*contd.*

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs a. p.	Rs. a. p.
Brought forward ..		97,54,436 10 11	Brought forward ..	4,23,593 13 10	36,48,606 4 3
Refund from Provident Fund for contributions disallowed to subscribers resigned		3,391 1 11	3. A. Dharwar Wilt	1,83,027 9 7	
Suspense Receipts		4 3 0	B. Do. Writing-up Scheme	10,080 10 4	
			4. Khandesh Cotton Breeding	26,232 9 0	
			5. Co-ordination of Cotton Research	1,625 5 0	
			6. Jalgaon Cotton Breeding	6,541 7 0	
			7. Broach Cotton Breeding	7,800 0 0	
			V. *Madras* (*a*) Herbaceum..	94,507 7 11	
			(*b*) Pempheres and Physiological	33,001 2 4	
			(*c*) Fodder Cholam	4,880 7 9	
			VI. *Punjab* (*a*) Botanical	3,83,371 8 11	
			(*b*) Entomological	1,15,981 7 1	
			(*c*) White Fly	18,914 15 6	
			(*d*) Root Rot	1,705 0 0	
			(*e*) Spraying Trials	3,250 0 0	
			VII. Central Provinces	2,75,392 10 2	
			VIII. United Provinces	1,39,979 0 9	
			IX. Institute of Plant Industry, Indore	11,21,343 12 0	
			X. Sind	1,34,346 5 6	
			XI. *Burma* (*a*) Capital expenditure	2,906 15 5	
			(*b*) Cotton Improvement	10,284 10 6	
			XII. Hyderabad (*a*) Botanical	88,800 12 11	
			(*b*) Cotton Survey	9,879 5 10	
			XIII. Bikaner	24,761 0 0	
			XIV. Baroda (1) Root Rot	13,055 13 6	
			(2) Comparative Tests..	4,107 0 0	
					31,39,370 14 10
			XV. Loans Recoverable (but considered doubtful)—		
			(1) Co-operative Cotton Sale Society, Hubli ..	10,513 0 0	
			(2) Do. do. Gadag ..	7,292 0 0	
				17,805 0 0	
			Less part received from the Co-operative Cotton Sale Society, Hubli	2,449 6 9	
					15,355 9 3
			By Suspense Account		1,684 3 6
			By Closing Balance		29,52,815 0 0
Grand Total ..		97,57,831 15 10	Grand Total ..		97,57,831 15 10

BALANCE SHEET AS AT MARCH 31ST, 1933.

Provident Fund Account.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE AND INVESTMENTS.	Rs. a. p.	Rs. a. p.
Subscribers' Contributions ..	1,18,772 8 9				
Less—Payments made to subscribers resigned..	31,752 9 7	87,019 15 2	By advances to subscribers ..	22,182 5 0	
			Less—Recoveries made upto 31st March 1933	20,236 4 0	1,946 1 0
Committee's Contributions ..	1,16,097 13 0				
			Accrued interest on Government Paper credited to subscribers upto 31st March 1933	....	1,738 2 0
Less—Payments made to subscribers resigned and forfeitures to the Committee	29,828 14 1	86,268 14 11	By Balance	....	1,70,531 0 11
Suspense deposit of Mr. Dutt's own contributions	....	926 5 10			
Total ..	....	1,74,215 3 11	Total ..	....	1,74,215 3 11

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED MARCH 31ST, 1933.

RECEIPTS.	Rs. a. p.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
Opening Balance*..		30,72,688 1 8	Administration of the Committee (including Improvement of Cotton Marketing, Seed Distribution and Extension and Printing and Propaganda)		2,56,202 8 8
Receipts under Section 12 of the Indian Cotton Cess Act, 1923 ..	4,96,974 12 2		Agricultural Research Grants-in-Aid		3,98,760 11 1
Less—Refund of Cotton Cess wrongly collected by the Collector, East Godavari ..	711 12 0		Technological Research		1,53,346 3 3
		4,96,263 0 2	CLOSING BALANCE— (Government Paper at cost.)		
Other receipts† ..	....	53,323 15 3		*Face Value.*	*Cost.*
Interest on Investments	....	1,55,889 2 8	3½% Govt. Promissory Notes .. .. Rs.	9,81,300	6,77,536 4 5
			5% Ten Year Bonds 1935 .. .. ,,	2,75,000	2,40,032 13 0
			5% Govt. of India Loan 1939-44 .. .. ,,	3,09,000	2,96,679 13 6
			‡4% Govt. of India Loan 1960-70 .. .. ,,	9,76,900	8,82,504 4 10
			4½% Govt. of India Loan 1955-60 .. .. ,,	26,600	25,004 0 0
			6% Bombay Municipal Debentures 1954 .. .. .. ,,	50,000	56,500 0 0
			6% Rangoon Municipal Coupon Debentures 1955 .. .. ,,	3,83,500	4,15,328 2 0
			6% Karachi Port Trust Coupon Debentures 1956 .. .. ,,	1,30,000	1,41,212 8 0
			(Market value as on 31st March 1933, Rs. 31,25,643-2-0.)		27,34,797 13 9
			Three Months Govt. Treasury Bills	75,000	74,640 10 0
			Fixed Deposits (with approved Banks)		1,15,000 0 0
			Imperial Bank of India Current Account		25,876 8 3
			Imprest—Committee's account .. .. Rs.	1,500	
			Imprest—Technological Laboratory .. .. ,,	500	
			Imprest—Cotton Research Botanist, Lyallpur .. .. .. ,,	500	
					2,500 0 0
			Suspense (Recoverable)		1,684 3 6
			Loans recoverable (but considered doubtful)		15,355 9 3
			§Total Closing Balance ..		29,69,854 12 9
Total ..	....	37,78,164 3 9	Total ..	....	37,78,164 3 9

*Includes Rs. 2,675-9-0 on account of Sinking Fund and Rs. 12,805 against Loans recoverable from Hubli and Gadag Co-operative Cotton Sale Societies.

†Includes Rs. 996-9-0 against Provision for Sinking Fund for the year 1932-33, Rs. 344-8 6 being Committee's contribution disallowed to subscribers and Rs. 48,671-12-7 being profit on sale of sterling securities.

‡Rs. 1,16,900 deposited with the Imperial Bank of India for Security against any Overdraft that may be required by the Committee.

§This includes Rs. 3,672-2-0 on account of provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required, and certify that to the best of our information and explanations received, the above statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, 29*th April* 1933.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

PROVIDENT FUND ACCOUNT AS AT MARCH 31ST, 1933.

RECEIPTS.	Rs. a. p.	Rs. a. p.
*To Opening Balance as on 1st April 1932	1,30,604 6 8	
Subscribers' Contributions 19,162 14 0		
Less—Refund to A. G., Bombay, for excess recovery from subscribers under Sind Schemes 2 0 0		
19,160 14 0		
Add—Recoveries against advances .. 4,737 10 0		
	23,898 8 0	
	1,54,502 14 8	
Less—Refunds to subscribers .. 2,744 6 2		
Advances to subscribers 4,447 14 0		
	7,192 4 2	
	1,47,310 10 6	
Committee's contribution received from Indian Central Cotton Committee at 100%	19,160 14 0	
	1,66,471 8 6	
Less—Refunds to subscribers who have resigned and refunds to Indian Central Cotton Committee on account of Committee's contribution disallowed to subscribers resigned	2,725 7 7	
		1,63,746 0 11
Interest received on Investments	7,527 3 3	
Interest received on advances to subscribers ..	175 13 0	
Refund of income-tax deducted on interest received during 1931-32	75 5 0	
	7,778 5 3	
Less—Interest paid during the year to subscribers who have resigned :—		
On their own contributions .. Rs. 39 12 4		
On Committee's contributions ,, 36 15 2		
Advance interest paid for securities purchased 345 2 6		
Income-tax deducted from interest on Investments (recoverable) 221 13 3		
Bank's commission for collection of interest 19 2 0		
Bank's withdrawal charges 5 0 0		
Cost of stationery 12 8 0		
Legal charges for amendment of Provident Fund Rules 313 0 0		
	993 5 3	6,785 0 0
Total ..	....	1,70,531 0 11

* Includes Rs. 882-9-7 Suspense Deposit account of Mr. Dutt, together with interest thereon.

PAYMENTS.	*Face Value.*	Rs. a. p. *Cost.*	Rs. a. p.
By Balance—			
(Government Paper at Cost.)			
3½% Government Promissory Notes	Rs. 85,600	59,754 3 1	
5% Government of India 1939-44 Loan	,, 25,600	24,606 15 6	
4% Government of India Loan 1934-37	,, 2,000	1,795 0 0	
4% Government of India Loan 1960-70	,, 32,600	30,085 12 0	
6½% City of Bombay Improvement Trust Loan	,, 17,500	17,471 4 0	
(Market value as on 31st March 1933, Rs. 1,56,350.)		1,33,713 2 7	
Imperial Bank of India Savings Bank account.		15,022 8 0	
Imperial Bank of India Current account ..		21,795 6 4	
†Total Closing Balance ..		....	1,70,531 0 11
Total ..		....	1,70,531 0 11

† Includes Rs. 926-3-10 being Suspense Deposit with interest thereon of Mr. Dutt's own contribution.

Examined and found correct.

BOMBAY, 29*th April* 1933.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31st, 1933.

Major Heads.	Total Sanctioned Grant.	Period. Yrs. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1933.	Expenditure from Capital Grants on (a) Lands and buildings.	Expenditure from Capital Grants on (b) Machinery, apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.			RESEARCH Rs. a. p.	SCHEMES. Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
II. *Technological Research*—									
(1) Technological Laboratory—									
(a) Capital Expenditure ..	5,04,799 3 8	} Permanent	1923	4,95,666 14 6	3,55,797 9 11	1,39,889 4 7	....	....	
(b) Working Expenses ..	12,04,240 2 7		Jan. 24	12,04,240 2 7	....	....	32,882 6 10	11,71,357 11 9	
(2) Provincial	39,072 15 3		April 28	39,072 15 3	....	....	2,566 15 3	36,506 0 0	
AGRICULTURAL RESEARCH GRANTS.									
IV. *Bombay Schemes*—									
(1) Surat Physiological and Writing up	2,91,445 0 0	10 1	Sept. 1923	2,44,705 6 3	....	....	23,334 5 2	2,21,371 1 1	Physiological Scheme closed down on 31st July 1932.
(2) (a) Surat Boll worm	1,20,720 0 0	7 7	Sept. 1923	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	Scheme closed down on 31st March 1931.
Do. (b) Writing up ..	2,420 0 0	.. 4	July 1932	2,420 0 0	....	....	....	2,420 0 0	
Do. (c) Propaganda and clean-up ..	1,28,764 0 0	3 3	April 1931	61,958 14 0	....	....	10,828 0 11	51,130 13 1	
(3) Dharwar—									
(a) Wilt and Cotton Breeding Scheme	2,63,545 0 0	8 9	Sept. 1923	1,83,027 9 7	....	....	13,713 3 7	1,69,314 6 0	Scheme closed down on 31st May 1932 and in July 1929.
(b) Writing up	11,355 0 0	.. 10	June 1932	10,080 10 4	....	....	....	10,080 10 4	Scheme closed down on 31st March 1933.
(4) Khandesh Cotton Breeding Scheme	27,995 0 0	5 6	Oct. 1926	26,232 9 0	....	....	....	26,232 9 0	Scheme closed down on 31st March 1932.
(5) Broach Cotton Breeding Scheme	67,885 0 0	5 ..	April 1932	7,800 0 0	....	....	927 3 9	6,872 12 3	
(6) Jalgaon Cotton Breeding Scheme	41,111 0 0	5 ..	April 1932	6,541 7 0	....	....	380 14 0	6,160 9 0	
(7) Co-ordination of Cotton Research	23,991 0 0	.. ..	Not started.	1,625 5 0	....	....	....	1,625 5 0	
V. *Madras Schemes*—									
(1) Herbaceum	1,07,460 0 0	10 6	Dec. 1923	94,507 7 11	....	....	4,416 1 10	90,091 6 1	
(2) Pempheres and Physiological.	66,000 0 0	2 4	Sept. 1931	33,001 2 4	....	....	4,848 13 4	28,152 5 0	
(3) Fodder Cholam—									
(a) Capital	900 0 0	} 5 5	Jan. 1931	} 4,880 7 9	}	{ 881 11 7	....	....	
(b) Recurring	16,800 0 0					....	168 9 0	3,830 3 2	
VI. *Punjab Schemes*—									
(1) Botanical—									
(a) Capital Expenditure ..	31,330 0 0	} 9 8	Aug. 1925	3,83,371 8 11	{ 22,158 0 0	9,102 11 0	....	....	*Rs. 2,030 transferred to Capital from Working Grant.
(b) Working Expenses ..	*5,23,900 0 0				....	....	16,109 14 0‡	3,36,000 15 11	
(2) Entomological—									
(a) Capital Expenditure ..	6,000 0 0	} 7 11	May 1926	} 1,15,981 7 1	....	{ 5,826 3 10	....	....	‡ Figure subject to revision on receipt of Annual Return for 1932-33.
(b) Working Expenses ..	1,44,060 0 0				....	....	6,914 8 9	1,03,240 10 6	
(3) White Fly	34,500 0 0	3 ..	May 1931	18,914 15 6	....	....	1,648 1 0	17,266 14 6	
(4) Root Rot	13,506 0 0	3 ..	Sept. 1932	1,705 0 0	....	....	31 11 0	1,673 5 0	
(5) Spraying Trials	11,250 0 0	1 ..	July 1933	3,250 0 0	....	....	2,315 12 0	934 4 0	
VII. *Central Provinces*	{ †61,000 0 0	2 6	Oct. 1923	} 2,75,392 10 2	....	....	4,494 6 10	2,70,898 3 4	†The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
	{ 3,22,165 0 0	8 ..	April 1926						
VIII. *United Provinces*—Pink Boll-worm Scheme—									
(a) Capital Expenditure ..	54,000 0 0	} 8 ..	July 1923	} 1,39,979 0 9	....	{ 47,834 13 6	....	} 89,078 15 0	
(b) Working Expenses	56,000 0 0					....	3,065 4 3		
(c) Recurring Grants for Staff ..	44,475 0 0	7 9½	Oct. 1926			....	....		

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1933—*contd.*

Major Heads.	Total sanctioned grant.	Period. Yrs.	Period. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1933.	Expenditure from Capital Grants on (a) Lands and buildings.	Expenditure from Capital Grants on (b) Machinery, apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3		4	5	6	7	8	9	10
IX. *Institute of Plant Industry, Indore*—	Rs. a. p.				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(a) Capital Expenditure ..	*2,33,536 11 9	Permanent.		Oct. 1924.	11,21,343 12 0	2,12,552 11 5	70,984 0 4	....	....	* Rs. 50,202-12-10 transferred from Recurring Grant to Capital.
(b) Working Expenses ..	8,37,807 0 3					....	....	31,857 4 4	8,05,949 11 11	
X. *Sind*	2,74,346 0 0	9	9	July 1927.	1,34,346 5 6	....	....	18,276 11 6	1,16,069 10 0	
XI. *Burma*—										
(a) Capital Expenditure ..	3,000 0 0	..	..	....	2,906 15 5	....	2,906 15 5	....	....	
(b) Cotton Improvement ..	49,032 0 0	6	..	April 1931.	10,284 10 6	....	....	1,936 4 0	8,348 6 6	
XII. *Hyderabad*—										
(a) Botanical	122,500 0 0	5	..	May 1929.	88,800 12 11	....	....	6,134 4 8	82,666 8 3	
(b) Cotton Survey	39,165 0 0	4	10	June 1931.	9,879 5 10	....	....	106 14 9	9,772 7 1	
XIII. *Bikaner*—										
(a) Capital Expenditure ..	14,500 0 0	5	..	Jan. 1931.	24,761 0 0	8,523 10 9	4,233 11 0	....	....	
(b) Working Expenses ..	38,200 0 0					....	....	....	12,003 10 3	
XIV. *Baroda*—										
(a) Root Rot	58,179 0 0	5	..	Feb. 1932.	13,055 13 6	....	....	2,158 1 0	10,897 12 6	
(b) Comparative tests of 1027 and I. A. Cottons..	4,280 0 0	1	..	April 1932.	4,107 0 0	....	....	137 9 0	3,969 7 0	
C. SEED DISTRIBUTION AND EXTENSION SCHEMES.										
1. *Bombay*—										
(i) Hubli	40,800 0 0	5	..	June 1930.	17,628 15 0	....	....	....	17,628 15 0	
(ii) Gadag	44,875 0 0	5	..	June 1930.	19,623 8 10	....	....	....	19,623 8 10	
(vii) Gadag Supplementary ..	21,448 0 0	4	..	June 1931.	11,264 1 10	....	....	2,762 10 6	8,501 7 4	
(iv) Haveri	27,752 0 0	5	..	....	....	....	....	....	....	Not yet started.
(v) Athani	46,757 0 0	5	..	April 1932.	1,940 0 0	....	....	1,000 0 0	940 0 0	
(vi) Bailhongal	27,425 0 0	5	..	....	....	....	....	....	....	Not yet started.
(vii) Surat	29,660 0 0	4	..	April 1930.	20,279 13 10	....	....	....	20,279 13 10	
(viii) Khandesh	†2,70,340 0 0	5	..	May 1931.	62,626 15 6	....	....	8,519 12 8	54,107 2 10	† Recoveries amounting to Rs. 1,10,000 are anticipated from this scheme which will reduce the actual cost from Rs. 2,70,340 to Rs. 1,60,340.
2. *Madras*—										
(i) Pay and Allowances of Business Manager, Tirupur.	18,000 0 0	5	..	Sept. 1931.	5,254 13 0	....	....	....	5,254 13 0	
(ii) Co. 2	31,310 0 0	5	..	Sept. 1932.	1,345 13 0	....	....	....	1,345 13 0	
(iii) H. 1	18,860 0 0	2	..	May 1933.	....	....	....	....	....	
3. *Punjab-Lyallpur Ginnery*	18,125 0 0	..	..	....	‡18,125 0 0	‡10,529 0 0	‡4,913 14 3	....	....	‡ The unexpended balance of Rs. 2,682-1-9 as per A.R. 32-33 is being refunded to the Committee.
4. *Sind*	3,89,540 0 0	8	..	April 1931.	49,794 14 0	....	....	1,847 15 3	47,946 14 9	
5. *Hyderabad State*	32,400 0 0	6	..	March 1930.	12,675 14 5	....	....	....	12,675 14 5	
6. *Central Provinces*	1,17,900 0 0	About 4 years.		Sept. 1930	53,016 4 5	....	....	....	53,016 4 5	

APPENDIX XI.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1.	Secretary	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S. ..	On deputation from Madras Department of Agriculture.
2.	Deputy Secretary	Vacant	
3.	Publicity Officer	Mr. R. D. Mihra, M.A. Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), Post-Grad., Res. B. Litt. (Oxon.).	——

TECHNOLOGICAL LABORATORY, BOMBAY.

4.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.) ..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
5.	Spinning Master	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
6.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
7.	Senior Research Assistant (Assistant Technologist).	Mr. D. F. Kapadia, M.Sc., Tech. (Manch.), B.A. (Bom.)	Research Scholar, Technological Laboratory (Textile Physics).
8.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
9.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Research Scholar, Technological Laboratory (Textile Physics).

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

10.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U. P.
11.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
12.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
13.	Temporary Research Assistant	Dr. R. N. Mathur, D.Sc. (Punjab)	Research Scholar, University Laboratories, Allahabad and Lahore.
14.	Electrician	Mr. Herculano Lobo, L.E.E. (V. J. T. I.) ..	——
15.	Junior Tester	Mr. S. S. Sukthankar, L.T.C. (V. J. T. I.) ..	——
16.	Junior Tester	Mr. K. G. Deo	——
17.	Junior Tester	Mr. H. B. B. Joshi, B.Sc.	——
18.	Junior Tester	Mr. K. S. Marar, B.A., LL.B.	——
19.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
20.	Junior Tester	Mr. G. D. Bhide, B.Sc.	——
21.	Junior Tester	Mr. K. V. N. Nayar	——
22.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
23.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
24.	Junior Tester	Mr. P. S. Sambamurthi	——
25.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
26.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

27.	Junior Tester	Mr. A. J. Farid		——
28.	Junior Tester	Mr. U. K. Benegal, B.A.		——
29.	Junior Tester	Mr. P. V. Nachane, B.Sc.		——
30.	Junior Tester	Mr. M. A. Gangat, B.Sc.		——
31.	Spinning Assistant	Mr. N. Iyengar		——
32.	Statistical Clerk	Mr. R. Krishna Iyer		——
33.	Statistical Clerk	Mr. P. K. Wagle		——

INSTITUTE OF PLANT INDUSTRY, INDORE.

34.	Director	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.).	Director of Research, Department of Agriculture, Iraq (1923-30).	
35.	Geneticist and Botanist	Mr. J. B. Hutchinson, M.A. (Cantab.)	Assistant Geneticist and Botanist, Trinidad (1926-33).	
36.	Extension Officer	Mr. Misri Lal Saxena, L.Ag. (Cawnpore)	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.	
37.	Farm Superintendent	Mr. G. C. Tambe, B.Ag. (Bombay)	——	
38.	Chemist and Agronomist	Mr. Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Research Student, Indian Central Cotton Committee.	
39.	Plant Breeding Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	——	
40.	Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)	——	
41.	Chemical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

		INSTITUTE OF PLANT INDUSTRY, INDORE—*contd.*	
42.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow)	——
43.	Assistant Farm Superintendent	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
44.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	——
45.	Junior Plant Breeding Assistant	Mr. N. S. Apte, B.Ag. (Bombay)	——
46.	Artist	Mr. S. Ayyer	On deputation, belongs to Madras.
		BOMBAY RESEARCH SCHEMES.	
		(i) *Entomological (Clean-up Scheme).*	
47.	Cotton Entomologist	Mr. B. P. Deshpande, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
48.	Graduate Assistant	Mr. B. J. Thakar, B.Ag.	Do. do.
49.	Graduate Assistant	Mr. M. S. Patel, B.Ag. (Bombay)	——
		(ii) *Broach Cotton Breeding Scheme.*	
50.	Cotton Breeder	Mr. G. B. Patel, B.Ag.	On deputation from Bombay Department of Agriculture.
51.	Botanical Graduate Assistant	Mr. P. L. Patel, M.Sc. (Iowa, U.S.A.)	——
52.	Pathological Graduate Assistant	Mr. Y. S. Kulkarni, B.Ag.	——
		(iii) *Jalgaon Cotton Breeding Scheme.*	
53.	Botanical Graduate Assistant	Mr. V. L. Bhosekar, B.Ag.	On deputation from Bombay Department of Agriculture.
54.	Pathological Graduate Assistant	Mr. J. D. Ranadive, B.Ag.	Research Student, Indian Central Cotton Committee.
55.	Non-Graduate Assistant	Mr. P. A. Rao	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES.

(i) *Hubli and Gadag.*

56.	Graduate Assistant	Mr. B. S. Patil, B.Ag. (Bombay)	——	
57.	Manager, Seed Farm, Gadag	Mr. G. Y. Kurli	On deputation from Bombay Department of Agriculture.	
58.	Graduate Assistant	Mr. B. S. Tadsur, B.Ag.	——	

(ii) *Surat.*

59.	Cotton Assistant	Mr. V. D. Desai	On deputation from Bombay Department of Agriculture.	

(iii) *Athani.*

60.	Graduate Assistant	Mr. B. M. Dhumma, B.Ag. (Bombay) ..	——	

(iv) *Khandesh (Banilla Scheme).*

Stage II.

61.	Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag.	On deputation from Bombay Department of Agriculture.	
62.	Non-Graduate Assistant	Mr. J. T. Bokil	Do.	do.

Stages III, IV and V.

63.	Cotton Superintendent, Jalgaon ..	Mr. S. V. Shevade, L.Ag.	On deputation from Bombay Department of Agriculture.	
64.	Graduate Assistant	Mr. R. B. Nimbalkar, B.Ag.	Do.	do.

SIND PHYSIOLOGICAL RESEARCH SCHEME.

65.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)	——	

SIND PHYSIOLOGICAL RESEARCH SCHEME—*contd.*

66.	Senior Assistant	Dr. T. J. Mirchandani, M.Sc. (Bombay), A.I.I.Sc. (Bangalore), Ph. D. (London).	——
67.	Junior Assistant	Mr. Rustom M. Ranji, Dip.Ag. (Bombay) ..	——
68.	Junior Assistant	Mr. R. N. Gidwani, B.Ag. (Bombay) ..	Research Student, Indian Central Cotton Committee.

SIND SEED DISTRIBUTION SCHEME.

69.	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. H. A. Indani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture.
70.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. K. H. Advani, B.Ag. (Bombay), M.Sc. (Texas, U.S.A.)	On deputation from Bombay Department of Agriculture.
71.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. H. W. Mughal, Agricultural Graduate, Poona College.	On deputation from Sind Department of Agriculture.
72.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. W. P. Shahani, B.Ag. (Bombay) ..	——
73.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj P. Tejwani	On deputation from Sind Department of Agriculture.
74.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani, F.Y.A.	——
75.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Partabsingh J. Bakshi	——
76.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. G. Pirzada, B.Ag. (Bombay)	——

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

77.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture.
78.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post Graduate, Pusa.	Do. do.
79.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
80.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.
81.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.
82.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.) ..	Do. do.
83.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	——

MADRAS RESEARCH SCHEMES.

(i) *Herbaceum.*

84.	Senior Assistant	Mr. R. Balasubramania Ayyar, B.A., B.Sc. (Ag.)	On deputation from Madras Department of Agriculture.
85.	Junior Assistant	Mr. G. Seshadri Ayyangar, M.A.	——
86.	Junior Assistant	Mr. V. Ramaswami Mudaliar, B.A.	——
87.	Sub-Assistant	Mr. D. Devasirvatham, Government Tech. Examination in Botany (Intermediate).	On deputation from Madras Department of Agriculture.

(ii) *Pempheres and Physiological.*

88.	Assistant Botanist	Mr. K. Dharmarajulu, B.Sc. (Bombay), M.Sc. (Bombay).	Research Student, Indian Central Cotton Committee.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

MADRAS RESEARCH SCHEMES—*contd.*

(ii) *Pempheres and Physiological—contd.*

89.	Assistant Chemist	Mr. M. Suryanarayana, B.Sc. (Calcutta), M.Sc. (Madras).	On deputation from Madras Department of Agriculture.	
90.	Assistant Entomologist	Mr. V. Margabandu, B.A. (Hons.). ..	Do.	do.

(iii) *Fodder Cholam.*

91.	Assistant	Mr. S. Sundaram, B.A., B.Sc. (Agri.) ..	Do.	do.

(iv) *Breeding of Nadam Cotton.*

92.	Assistant	Mr. K. L. Ramakrishna Rao, L.Ag.	Do.	do.

MADRAS SEED DISTRIBUTION SCHEMES.

(i) *Pay of Business Manager.*

93.	Business Manager, Tirpur Co-operative Trading Society.	Mr. K. Avudanayakam Pillai, L.Ag. ..	Do.	do.

(ii) *H. I.*

94.	Agricultural Demonstrator, Bellary ..	Mr. R. Govindarama Ayyar, L.Ag.	Do.	do.
95.	Agricultural Demonstrator, Guntakal ..	Mr. P. S. Atmarama Ayyar, L.Ag.	Do.	do.

(iii) *Co.* 2.

96.	Agricultural Demonstrator	Mr. M. Damodara Prabhu, B.Sc. (Agri). ..	Do.	do.
97.	Agricultural Demonstrator	Mr. L. Krishnan, B.A., B.Sc. (Agri.) ..	Do.	do.
98.	Agricultural Demonstrator	Mr. P. P. Syed Muhamad, B.Sc. (Agri.) ..	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd.*

PUNJAB RESEARCH SCHEMES.

(i) *Botanical.*

99.	In charge of the duties of Cotton Research Botanist.	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee, and State Research Scholar. On deputation from Punjab Department of Agriculture.
100.	Assistant to Cotton Researeh Botanist ..	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.
101.	Technical Assistant	Bh. Autar Singh, B.Sc. (Agri.)	——
102.	Junior Research Assistant	Mr. Akbar Ali, B.Sc. (Post-Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
103.	Technical Assistant	Mr. Ramesh Chandar, M.Sc. (Agri.)	On deputation from Punjab Department of Agriculture (Temporary).
104.	Technical Assistant	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Alam.	On deputation from Punjab Department of Agriculture.
105.	Assistant Physiologist and Microscopist.	Mr. B. K. Kar, M.Sc. (Allahabad), Post-Graduate Scholar, U. P. Government.	——

(ii) *Entomological.*

106.	Assistant Cotton Entomologist	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	——
107.	Field Assistant, Sialkot Research Work.	Mr. Ladha Ram, B.Sc.	——
108.	Field Assistant, Rohtak Research Work .	L. Ganda Ram, B.Sc., F.E.L.	——
109.	Field Assistant, Lyallpur Research Work.	Mr. Nazir Ahmad, M.Sc.	——
110.	Statistical Assistant	Mr. Manzoor Abbas, B.Sc. (Agri.)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*contd*

PUNJAB RESEARCH SCHEMES—(*contd.*)

(iii) *White Fly.*

111. Assistant Cotton Entomologist	L. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
112. Field Assistant	Mr. Piare Mohan Verma, B.Sc. (Hons.) (Punjab), M.Sc.	Research Student, Indian Central Cotton Committee.
113. Field Assistant	L. Hari Chand, B.Sc. (Agri.)	——

(iv) *Root Rot.*

114. Investigator	Dr. R. S. Vasudeva, B.Sc., Ph.D. (London), D.I.C. (London).	——

UNITED PROVINCES RESEARCH SCHEMES.

(i) *Entomological.*

115. Special Research Assistant	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab).	Research Student, Indian Central Cotton Committee.

(ii) *Rohilkhand and Bundelkhand Survey.*

116. Agricultural Inspector	Mr. Attar Singh, L.Ag. (Cawnpore) ..	On deputation from the United Provinces Department of Agriculture.

HYDERABAD RESEARCH SCHEMES.

(i) *Botanical.*

117. Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab) .	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
118. Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona) ..	On deputation from Bombay Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1933—*concld.*

HYDERABAD RESEARCH SCHEME—*contd.*

(i) *Botanical—contd.*

119. Assistant Cotton Research Botanist	.. Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).		
120. Second Assistant Botanist	.. .. Mr. N. R. Yardi, B.Ag. (Bombay)	On deputation from H. E. H. the Nizam's Department of Agriculture.	——

(ii) *Cotton Survey.*

121. Assistant Cotton Research Botanist	.. Mr. B. B. Mulchandani, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.	

HYDERABAD SEED DISTRIBUTION SCHEME.

122. Inspector	Mr. M. V. Chitnis	——	

BARODA ROOT ROT SCHEME.

123. Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.	
124. Mycological Assistant	Mr. G. H. Desai, B.Ag. (Bombay)	——	
125. Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	——	

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

126. Under Cotton Specialist, Coimbatore	.. Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.	
127. Under Cotton Breeder, Dharwar	.. Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.	
128. Under Cotton Research Botanist, Lyallpur.	Mr. K. R. Sen, M.Sc. (Dacca)	Research Student, Indian Central Cotton Committee.	
129. Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Do.	do.

APPENDIX XII.

RESEARCH STUDENTSHIPS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. In charge of the duties of Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Do.
6 ,,	Jiwan Singh, M.Sc. (Punjab).	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Sind Agricultural Department.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	Special Research Assistant, Pink Boll-worm Investigation, United Provinces.	Do.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University)	Surat	Cotton Physiology..	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department, Junior Research Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology .	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
8 „	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Abroad for further study ..	Technological Assistant, Dharwar, up to 31st July 1929.
„	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Graduate Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh.	Indian Central Cotton Committee.
„	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
„	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee.
„	L. N. Rao, M.Sc. (Calcutta) ..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay) M.Sc. (Tech., Manchester).	Do. ..	Cotton Technology .	Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
„	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Do.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology. .	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	....
,,	Karam Singh Lamba, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology .	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Coimbatore.. ..	Cotton Bio-chemistry.	Chemist and Agronomist, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Sind Agricultural Department, Cotton Supervisor, Indus Right Bank, Sind Seed Distribution Scheme	Do.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Assistant Farm Superintendent, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Coimbatore.	Do.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology .	Government scholar for study abroad.	Obtained Ph.D. (Cantab.)
,,	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do. ..	....	Obtained Doctorate at Edinburgh.
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology. .	Unemployed	....

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1927	Sant Singh Varma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	Abroad for further study.	Granted a Foreign Scholarship by the Indian Central Cotton Committee.
,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. , ..	Unemployed ..	....
,,	S. Shamser Singh. M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy .	.Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab), M.Sc.	Cawnpore	Cotton Entomology .	Field Assistant, White Fly Investigation, Punjab.	Do.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Junior Assistant, Sind Physiological Research Scheme.	Do.
5 ,,	M. Kanti Raj, M.A., B.Sc. (Agri.,) (University of Edinburgh).	Institute of Plant Industry, Indore.	Do. ..	Madras Agricultural Service.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
1929	Srinagabhushana, B.Sc. ..	Do. ..	Do. ..	Technological Assistant, Surat.	Do.
3 ,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do. ..	Do. ..	Do.	....

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1930	Madan Lal Bhatia M.Sc. (Punjab).	Lyallpur	Entomology ..	Research Student ..	Under training.
4 ,,	Bhola Nath, M.Sc. (Punjab) .	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Do.	
,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
,,	Brajandra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	Research Student ..	Under training.
1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Cotton Marketing and Economics.	....	Resigned.
4 ,,	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	Dist. Supervisor, Enquiry into the cost of production of Cotton and Sugarcane crops, Central Provinces.	....
,,	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do.	Research Student ..	Under training.
,,	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do. ..	Do. ..	Do.
		Foreign Research Studentships.			
1 1931	Sant Singh Verma, M.Sc. (Benares Hindu University.)	Imperial College of Science and Technology London.	Plant Physiology ..	Do. ..	Do.
		Training Grants.			
1933	S. N. Venkatramanan, B.A., B.Sc. (Agri.) (Madras).	Calcutta ..	Cotton Statistics ..	Research Student ..	Do.
2 ,,	C. Jagannatha Rao, B.A. (Madras).	..	Cotton Physiology ..	Not yet joined ..	....
		Foreign Training Grants.			
1933	M. Taskhir Ahmad, B.Sc. (Agri). (Punjab).	....	Entomology ..	Not yet joined ..	....
2 ,,	G. B. Patel, B. Ag. (Bombay).	....	Cotton Breeding ..	Do. ..	....

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants.

ANNUAL REPORT

OF THE

Indian Central Cotton Committee,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST 1934.

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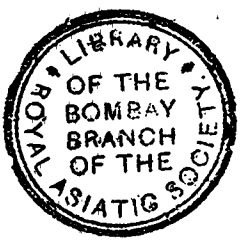
1934.



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Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1934.

CHAPTER I.

THE Indian Central Cotton Committee was constituted by Resolution No. 404-22, dated the 31st March 1921, of the Government of India in the Department of Revenue and Agriculture and was the direct outcome of the Indian Cotton Committee whose report was published in 1919. Initially the Committee was purely an advisory body, but with the passing of the Cotton Cess Act in 1923 it was incorporated and provided with funds for the purpose of improving and developing the growing, marketing and manufacture of cotton in India. The Committee thus fulfils two main functions, viz., it advises the Government of India and Local Governments on matters concerning the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention and, secondly, it provides funds for research into cotton problems of an all-India importance or for large areas where cotton is an important crop and for the extension and marketing of improved varieties of cotton. The research section of the Committee's work has now gone beyond the experimental stage, as will be seen in Chapters III and IV of this report.

In addition to the above, the Committee offers a common meeting ground for all branches of the cotton industry. All the main interests associated with cotton, viz., the grower, the ginner, the exporter, the mill-owner and the agricultural expert, are represented on the Committee, as will be seen below, and there is no branch of cotton industry in India which the Committee cannot deal with authoritatively. The Committee, however, keeps in the forefront the interests of the cotton grower whose welfare has always been its primary concern.

PERSONNEL.

2. Under the Indian Cotton Cess Rules, members hold office for three years, and one-third of them retire annually in rotation. The following were the members of the Committee on the 31st August 1934 :—

(1) PRESIDENT.—Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.

Madras	Mr. S. V. Ramamurty, I.C.S., Director of Agriculture.
Bombay	The Director of Agriculture.
United Provinces ..	Mr. R. G. Allan, I.A.S., Director of Agriculture.
Punjab	Mr. H. R. Stewart, I.A.S., Director of Agriculture.
Central Provinces ..	Mr. J. H. Ritchie, I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.

The East India Cotton Association	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E. (*Vice-President*).
The Bombay Mill-owners' Association .	Mr. S. D. Saklatvala.
The Bombay Chamber of Commerce ..	Mr. H. B. Moore.
The Indian Merchants' Chamber	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. F. G. Travers.
The Ahmedabad Mill-owners' Association .	Seth Sakarlal Balabhai.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce	Mr. E. J. W. Plummer.
The Empire Cotton Growing Corporation	Mr. W. Roberts, C.I.E.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.

Central Provinces ..	Mr. Y. G. Deshpande. Rao Bahadur G. R. Kothare, M.L.C.
Madras	Mr. J. Nuttall.
Punjab	Khan Bahadur Sardar Habibullah, M.L.C.
Bengal	Mr. Akhil Bandhu Guha.

(7) CO-OPERATIVE BANKING REPRESENTATIVE.—Rao Bahadur M. G. Deshpande, C.B.E.

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY.

Madras	Mr. K. S. Ramaswami Gownder. M. R. Ry. K. Sarabha Reddi Garu.
Bombay	Sardar Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Bahadur Chenbasappa Shidramappa Shirahatti.
United Provinces ..	Rai Bahadur Lala Anand Sarup, M.L.C. Vacant.
Punjab	Sardar Sampuran Singh, M.L.C. Mian Nurullah, M.L.C.
Central Provinces and Berar.	Mr. N. M. Deshmukh. Mr. J. B. Deshmukh.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.

Hyderabad State ..	Mr. Nizam-ud Din Hyder, Director of Agriculture.
Baroda State	Mr. C. V. Sane, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Director of Agriculture.
Rajputana and Central India States	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL-IN-COUNCIL.

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Mr. S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
3. M. R. Ry. V. Ramanatha Ayyar, Avl., Cotton Specialist, Coimbatore.
4. Musahib-i-Khas Bahadur S. V. Kanungo, Finance Minister, Holkar State, Representative of the Holkar State.
5. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind.
6. Seth Isserdas Varindmal, Representative of the Karachi Indian Merchants' Association.
7. Mr. P. B. Richards, I.A.S., Offg. Director of Agriculture, United Provinces.
8. Khan Bahadur Nawab Fazl-i-Ali Khan, Chairman, District Board and President, Central Co-operative Bank, Ltd., Gujrat (Punjab).
9. Khan Saheb Farrukhbeg Sadikalibeg Mirza, Nawabshah, Sind.
10. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.

Secretary.—Mr. P. H. Rama Reddi, I.A.S.
Deputy Secretary.—Vacant.
Director, Technological Laboratory.—Dr. Nazir Ahmad.
Publicity Officer.—Mr. R. D. Mihra.

Dr. L. C. Coleman, Director of Agriculture, Representative of the Mysore State, appointed by the Governor-General-in-Council under Section 4 (*xi*) of the Indian Cotton Cess Act, resigned from the Committee in the course of the year.

Sir Purshotamdas Thakurdas was re-elected Vice-President for the year 1934-35.

SUB-COMMITTEES.

3. *Standing Finance Sub-Committee.*—As required by the Rules under the Indian Cotton Cess Act, the following members were appointed to form the Standing Finance Sub-Committee :—

Sir Purshotamdas Thakurdas (*Vice-President*), *Chairman*, Dewan Bahadur Sir T. Vijayaraghavacharya (*ex-officio*), Mr. H. B. Moore, Mr. S. D. Saklatvala, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Rao Bahadur G. R. Kothare, Mr. J. O. G. Barnes and Mr. Chunilal B. Mehta.

Mr. J. O. G. Barnes retired with effect from the 1st April 1934 and his place was filled by Mr. G. C. R. Coleridge. On the latter's resignation Mr. F. G. Travers was appointed to succeed him.

Mr. J. Vonesch was temporarily out of India and Seth Sakarlal Balabhai was appointed to fill the temporary vacancy.

The Sub-Committee met eight times during the year.

4. *Local Sub-Committee.*—This Sub-Committee consists of all members living in or near Bombay, though any member of the Committee may attend its meetings. It comprised the following members :—

Dewan Bahadur Sir T. Vijayaraghavacharya (*President*), Sir Purshotamdas Thakurdas (*Vice-President*), Mr. H. B. Moore, Mr. S. D. Saklatvala, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Girdharlal B. Kotak, Mr. J. O. G. Barnes, Mr. Chunilal B Mehta and Mr. C. V. Sane.

Mr. Girdharlal B. Kotak retired during the year and his vacancy remained unfilled.

Mr. J. O. G. Barnes retired with effect from the 1st April 1934 and Mr. G. C. R. Coleridge was appointed in his place. When the latter resigned, Mr. F. G. Travers succeeded him.

The temporary vacancy caused by the absence out of India of Mr. J. Vonesch remained unfilled.

Mr. C. V. Sane resigned his membership on the Sub-Committee and Rao Bahadur G. R. Kothare was appointed in his place.

The Sub-Committee held seven meetings during the year.

5. *Cotton Ginning and Pressing Factories Sub-Committee.*—This Sub-Committee, like the Standing Finance Sub-Committee, is also a statutory body appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. It was composed of the following members:—

Sir Purshotamdas Thakurdas (*Vice-President*), Mr. J. Vonesch, Mr. J. O. G. Barnes, Mr. Chunilal B. Mehta, Mr. G. B. Kotak, Mr. J. Nuttall, Mr. W. Roberts, Mr. E. J. W. Plummer, Mr. Y. G. Deshpande, Mr. H. B. Moore, Rao Bahadur M. G. Deshpande and Lala Shri Ram (co-opted member).

The question of filling the vacancies arising from the retirement of Messrs. Barnes and Kotak during the year will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee did not meet during the year under report as there were no questions requiring its special attention.

6. *Agricultural Research Sub-Committee.*—This Sub-Committee ordinarily assembles during the meetings of the full Committee, reports on the progress made on the schemes financed by the Committee, examines proposals for new research schemes or extensions of schemes in operation and considers the reports of research students. The Sub-Committee was constituted as follows :—

The President, The Vice-President (Sir Purshotamdas Thakurdas), Mr. F. K. Jackson, Rao Bahadur M. G. Deshpande, Mr. W. Roberts, Mr. H. B. Moore, Dr. W. Burns, Mr. J. H. Ritchie, Mr. H. R. Stewart, Mr. V. Ramanatha Ayyar ; Mr. B. C. Burt, Dr. L. C. Coleman, Mr. D. N. Mahta, Rai Saheb Thakur Ram Prasad Singh, Mr. H. H. Pandya, Mr. W. J. Jenkins, Mr. P. B. Richards, Mr. S. V. Ramamurty, Mr. C. V. Sane and Mr. Chunilal B. Mehta (additional members); The Cotton Research Botanist, Lyallpur, and the Cotton Research Botanist, Parbhani (co-opted members) and the Secretary.

Dr. L. C. Coleman retired during the year and his seat on the Sub-Committee remained vacant.

Rai Saheb Thakur Ram Prasad Singh also retired during the year. His place on the Sub-Committee remained unfilled as his successor on the Committee, Mr. P. B. Richards, was already an additional member of the Sub-Committee.

Rao Bahadur D. Ananda Rao Garu was co-opted as a member on the Sub-Committee at its January 1934 meeting. Khan Bahadur Maulvi Fateh-ud Din, Mr. Nizam-ud Din Hyder, Mr. A. K. Yegna Narayana Iyer and Rai Saheb Thakur Ram Prasad Singh were co-opted as members at the August 1934 meeting of the Sub-Committee.

A special meeting of the Sub-Committee to examine the results of old and present schemes and to discuss the Research and Seed Distribution policy of the Committee was held on the 29th and 30th June 1934.

The Sub-Committee met thrice during the year.

7. *Technological Research Sub-Committee.*—This Sub-Committee, like the Agricultural Research Sub-Committee, generally meets during the half-yearly meetings of the Indian Central Cotton Committee and deals with all matters connected with the Technological Laboratory and Technological Research. The Sub-Committee appointed at the January 1934 meeting of the Committee consisted of the following members :—

The President, Sir Purshotamdas Thakurdas (*Vice-President*), Mr. S. D. Saklatvala, Mr. B. C. Burt, Mr. H. R. Stewart, Dr. W. Burns, Mr. Chunilal B. Mehta, Mr. Y. G. Deshpande, Seth Naranlal Jivanlal, Mr. S. V. Ramamurty, Mr. H. B. Moore, Lala Shri Ram, Mr. E. J. W. Plummer, Dr. Nazir Ahmad and the following co-opted members :—

Sir Munmohandas Ramji ..	Representatives of the Bombay
Mr. F. Stones	Millowners' Association.
Seth Kasturbhai Lalbhai ..	Representatives of the Ahmedabad
Seth Chamanlal G. Parekh .	Millowners' Association.
Seth Jamnadas Ramdas ..	Representatives of the East India
Mr. R. G. Saraiya	Cotton Association.

Sir Munmohandas Ramji died during the year and his seat on the Sub-Committee was taken by Mr. A. D. Walwyn.

Rao Bahadur D. Ananda Rao Garu and Khan Bahadur Maulvi Fateh-ud Din were co-opted as members on the Sub-Committee at its January and August 1934 meetings, respectively.

On the retirement of Seth Naranlal Jivanlal in April 1934, his successor on the Committee, Seth Sakarlal Balabhai, was appointed in August 1934 as a co-opted member on the Sub-Committee for the remaining period of the financial year 1934-35.

Two meetings of the Sub-Committee were held during the year.

8. *Research Students Selection Sub-Committee.*—The following members were appointed at the January 1934 meeting of the Committee to form the Research Students Selection Sub-Committee :—

The President, Sir Purshotamdas Thakurdas (*Vice-President*), Mr. B. C. Burt, Dr. W. Burns, Mr. P. B. Richards, Mr. H. R. Stewart, Mr. J. H. Ritchie, Mr. S. V. Ramamurty, Dr. L. C. Coleman, Mr. H. H. Pandya, Mr. W. J. Jenkins, Mr. F. K. Jackson, Mr. C. V. Sane and Dr. Nazir Ahmad.

Dr. L. C. Coleman resigned his appointment on the Committee during the year and the question of the appointment of his successor will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee did not meet during the year as no studentships were awarded.

9. *Sub-Committee on Malpractices.*—The constitution of this Sub-Committee was as under :—

Sir Purshotamdas Thakurdas (*Vice-President*), Mr. H. B. Moore, Seth Naranlal Jivanlal, Mr. J. O. G. Barnes, Mr. Chunilal B. Mehta, Dr. W. Burns and Sardar Sampuran Singh, with power to co-opt.

The question of filling the vacancies of Seth Naranlal Jivanlal and Mr. J. O. G. Barnes, who retired during the year, will be taken up at the next meeting of the Sub-Committee.

The Sub-Committee did not meet during the year under report.

10. *Forecast Improvement Sub-Committee.*—This Sub-Committee was appointed in February 1933 to deal with the improvement of cotton forecasts. The Sub-Committee appointed at the January 1934 meeting of the Committee consisted of the following members :—

The President, The Director-General of Commercial Intelligence and Statistics, The Director of Agriculture, Bombay ; The Director of Agriculture, Punjab ; The Director of Agriculture, Madras ; The Director of Agriculture, United Provinces ; The Director of Agriculture, Baroda ; The Director-General of Commerce and Industry, H.E.H. the Nizam's Government, Hyderabad, and The Director of Land Records, Central Provinces and Berar.

The Director-General of Commerce and Industry, H.E.H. the Nizam's Government (Mr. B. A. Collins), resigned from the Committee during the year under review and his place on the Sub-Committee remained unfilled.

The Sub-Committee met twice during the year.

11. *Special Sub-Committees.*—As required by the Rules under the Indian Cotton Cess Act, a Special Sub-Committee met during the year to select candidates for the posts of Plant Physiologist and Bio-Chemist in connection with the scheme for investigation into the causes of the periodic partial failure of the American cotton crop in the Punjab.

12. Most of the detailed work of the Committee is carried on through its Sub-Committees and thereby the time of the full Committee at its half-yearly meetings is considerably economised. The Committee is indebted to the members of the various Sub-Committees for the time and thought which they bestowed on its work. To the members of the Standing Finance and the Local Sub-Committees in particular are the thanks of the Committee due as owing to the frequency of the meetings of these Sub-Committees the calls upon the time and services of the members of these two Sub-Committees were greater.

(*a*) Sardar Rao Bahadur Bhimbhai Ranchodji Naik continued as the Committee's representative on the Imperial Council of Agricultural Research.

(*b*) As stated in the Committee's last Annual Report, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. N. M. Deshmukh and Mian Nurullah were nominated to the Board of Directors of the East India Cotton Association by the Committee from among its growers' representatives for the cotton year 1933-34, but all three of them could not take their seats on the Board pending the amendment of the Articles of Association of the East India Cotton Association. The Committee accordingly decided at its January 1934 meeting that Mr. N. M. Deshmukh and Mian Nurullah should serve on the Board until the Articles of Association were amended. The necessary amendment was given effect to in July 1934 and from that month all the above three gentlemen served as Directors of the Board of the East India Cotton Association. They have been re-nominated for the cotton year 1934-35.

(*c*) The following gentlemen represented the Committee on the Joint Sub-Committee of the Imperial Council of Agricultural Research and the Committee in connection with the investigation into the cost of growing cotton, sugar-cane and their rotation crops :—

Sir Purshotamdas Thakurdas, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. Chimanlal B. Parikh (representative of the East India Cotton Association) and the Secretary.

MEETINGS.

13. The Committee held two meetings during the year under report, both of which were in Bombay. The first meeting took place on the 29th and 30th January 1934 when His Excellency the Right Honourable Michael Herbert Rudolf Knatchbull, Lord Brabourne, G.C.I.E., M.C., Governor of Bombay, honoured the Committee by his presence and the following attended as visitors :—

Sir Richard H. Jackson, Chairman, Lancashire Indian Cotton Committee, Manchester.

The Hon'ble Dewan Bahadur S. T. Kambli, J.P., Minister for Agriculture, Government of Bombay.

The Hon'ble Khan Bahadur D. B. Cooper, J.P., Minister for Local Self-Government, Government of Bombay.

Sir Joseph A. Kay, Kt., ex-Vice-President.

Major W. Ellis Jones, M.L.C., ex-Vice-President.

Sir Munmohandas Ramji, Kt...
Mr. T. V. Baddeley .. ..
Mr. H. H. Lakin .. ..
Mr. Madhavji D. Thackersey..
} Representatives of the Bombay Mill-owners' Association.

Seth Kasturbhai Lalbhai, Ahmedabad.

Mr. W. D. M. Clarke, His Majesty's Trade Commissioner at Bombay.

Rao Bahadur D. Ananda Rao Garu, Officiating Director of Agriculture, Madras Presidency.

Mr. G. B. Phanse, Deputy Director of Statistics, Calcutta.

Mr. J. B. Hutchinson, Geneticist and Botanist, Institute of Plant Industry, Indore.

Mr. Nizam-ud Din Hyder, Director of Agriculture, H.E.H. the Nizam's Government, Hyderabad.

Rai Saheb Kalidas Sawhney, Cotton Research Botanist, Parbhani.

Mr. Mohammad Afzal, Cotton Research Botanist, Lyallpur.

Mr. G. P. Pathak, Acting Deputy Director of Agriculture, Gujerat.

Mr. M. L. Patel, Cotton Breeder, Gujerat.

Mr. Balubhai Kalidas Patel, Chairman, Sonsek Co-operative Cotton Sale Society.

Mr. Makanji Kahanji Patel, Supervisor, Gujerat Co-operative Cotton Sale Societies Union, Sonsek.

The second meeting of the Committee was held on the 28th and 29th August 1934 and it was attended by the following visitors :—

Mr. T. C. S. Jayarutnam, I.C.S., Director of Land Records, Central Provinces.

Mr. M. D. Williams, British Cotton Growing Association (Punjab), Ltd., Khanewal.

Mr. P. M. Joseph, Deputy Director of Statistics, Department of Commercial Intelligence and Statistics, Calcutta.

Mr. J. B. Hutchinson, Officiating Director, Institute of Plant Industry, Indore.

Mr. A. K. Yegna Narayana Iyer, Director of Agriculture, Mysore State.

Rai Saheb Thakur Ram Prasad Singh, Economic Botanist to Government (for cotton), United Provinces.

Mr. B. S. Patel, I.A.S., Deputy Director of Agriculture, Gujerat.

Mr. C. G. Paranjpe, Agricultural Engineer to the Government of Bombay.

Mr. B. P. Deshpande, Cotton Entomologist, Broach.

Dr. V. N. Likhite, Officer-in-Charge, Cotton Root Rot Scheme, Baroda.

A list of the important resolutions passed at these two meetings will be found in *Appendix I.*

STAFF.

14. Mr. P. H. Rama Reddi held charge of the office of Secretary throughout the year.

The post of Deputy Secretary remained vacant.

Mr. R. D. Mihra held the post of the Publicity Officer during the year.

Dr. Nazir Ahmad continued to be the Director, Technological Laboratory, till the 12th March 1934, when he proceeded on four months' and twenty days' leave and one month on deputation and during his absence Mr. R. P. Richardson, Spinning Master, acted for him.

Mr. Mohammad Afzal who held the charge of the duties of the Cotton Research Botanist, Lyallpur, since the resignation of Mr. Trevor Trought, was appointed as Cotton Research Botanist during the year under review.

I wish to record my high appreciation of the hearty co-operation of every member of the staff, which I received during the year as in the past.

PROVINCIAL COTTON COMMITTEES.

15. Provincial Cotton Committees met as follows during the year :—

Punjab Provincial Cotton Committee	Once.
Central Provinces Provincial Cotton Committee ..	Once.
Sind Cotton Committee	Twice.

CHAPTER II.

FEATURES OF THE YEAR.

A. Season.

16. The year under report witnessed a slight increase in the area of cotton in India. From 22,483,000 acres in the previous year, which was the lowest for the past one decade, the area rose to 23,739,000 acres in 1933-34. Though weather conditions at the time of sowing were not quite favourable, the crop on the whole was reported to be fair throughout the growing season. The estimated yield was 4,970,000 bales of 400 lbs. as against 4,656,000 bales of the preceding season, and the average yield per acre was 84 lbs.

The crop of 1933-34 accounted for in cotton press returns was, however, more than the forecasted crop ; 4,045,516 bales were pressed in British India and 1,286,317 bales in Indian States, making a total of 5,331,833 bales for the whole of India, the corresponding figures for the preceding season being 3,316,639 bales and 1,360,959 bales and 4,677,598 bales, respectively. The quantity of loose cotton received during the season by mills in the major cotton growing provinces of British India amounted to 221,996 bales of 400 lbs. as against 215,279 bales in the previous season. The crop of the season thus accounted for by press returns and loose cotton received at mills was 5,553,829 bales.

The decline in the prices of Indian cotton relative to those of Americans noticed during the previous season steadily continued throughout the year under report. This was partly due to the reaction from the abnormal price position of Indian cotton in the previous seasons as a result of short crops. The boycott of Indian cotton by Japan, which started in June 1933, continued to depress the Indian market almost till early January, when the boycott was lifted. Prices thereafter gradually advanced but received a setback in March and April in a general decline and never recovered, even though American prices later rose as a result of the acreage restriction programme. The publication of the first Bureau Report in August witnessed a spurt in prices which has not, however, since been maintained.

As a result, imports of American cotton to India fell off and exports of Indian cotton rose from 2,741,000 bales of 400 lbs. in 1932-33 to 3,204,000 bales in the year under report. The world's total consumption of Indian cotton, too, increased from 4,137,000 bales in the previous year to 4,770,000 bales in the year ending 31st July 1934. The quantity of Indian cotton consumed in India was slightly less during the year under review than in the previous year (vide *Appendix III*). This was mainly due to the strike at Bombay in the months of April, May and June.

B. Work of the Year.

17. The year under report was very eventful for the Committee. The Agricultural Research Sub-Committee made a very careful and thorough examination of all the past and present research schemes of the Committee, and laid down the principles that should be followed, in future, with regard to new research schemes. In the matter of cotton policy for India, the events of the year have amply proved the unwisdom of continuing the production in India of large quantities of short-staple cotton for which there is only a limited market at present, and of which the future is problematic in view of the increasing tendency of the world's mills to spin finer counts. The question of the possibility of growing medium and long-staple cottons in areas at present growing short-staple cotton is therefore one of considerable importance. It is hoped that the Committee would soon be able to consider this question in all its aspects.

In the meantime, a definite step forward has been taken during the year to increase the supply of staple cotton in India. The Committee has very strongly recommended to the Government of Bombay that a compact block of three lakhs acres should be set apart for the cultivation of long-staple cotton in Sind in the Sukkur Barrage canal irrigated areas. Another notable advance made during the year is the termination of the long-drawn controversy of relative superiority of 1027 A.L.F. and 1-A cottons for the tract lying to the south of the river Nerbudda. A mass of data relating to the yield, ginning percentage, fibre properties, spinning test results and prices of these two cottons was carefully sifted and examined by the Committee, before taking the final decision that 1027 A.L.F. was definitely the type which was preferred by the spinner, which had an assured demand, and which was, above all, more paying to the grower on its own merits. This decision has been supplemented by the Committee by financing two schemes, one in the British territory of the tract and the other in the Baroda State, for the distribution and extension of 1027 A.L.F. cotton seed. Still one more important event in this connection is the action taken by the Committee during the year in inaugurating a large scheme for the extension of Verum 262 and other staple cottons on a large scale in the short-staple tract of the Central Provinces.

A brief reference was made in last year's report to the discontinuance by Japan of purchases of Indian cotton from June 1933, and its effect on the cotton industry of India. The Special Sub-Committee appointed by the Indian Central Cotton Committee in August 1933 to consider the question of a wider market for Indian cotton and to formulate, in particular, the views of the Committee on matters arising out of the boycott, met on the 13th September 1933 and nominated Sardar Rao Bahadur Bhimbhai Ranchodji Naik and Mr. J. Vonesch to serve on the panel of unofficial advisers to the Indian Delegation as the respective representatives of cotton growing, and up-country cotton marketing interests. The representatives of the Committee were given *carte blanche* to deal with all matters referred to them at Simla, keeping in view the important principle that the cotton-growing

and cotton-manufacturing interests of India were interdependent, and that when one was affected, the other also was, under certain circumstances, bound to suffer, but that if need be, the interests of the mill industry should be subordinated to those of the cotton grower. The course of subsequent events at Simla and New Delhi culminating in the successful conclusion of a new trade agreement with Japan, and the lifting of the boycott on the 8th January 1934 are too well known to require repetition here.

Mention was also made in last year's report of the establishment, from the outset, of excellent relations between the Committee and the newly formed Indian Cotton Enquiry Committee of Lancashire. This Committee has since been strengthened by the appointment of additional members and re-named the Lancashire Indian Cotton Committee. Sir Richard Jackson, Chairman of this Committee, came out to India at the end of January 1934, and spent two months touring the main cotton tracts of India studying various types of Indian cotton and their possibilities for increased consumption in Lancashire, and discussing marketing and other problems with cotton interests in India. Sir Richard was joined in March 1934 by the late Mr. R. Fleming, who had considerable experience of Indian cotton trade, and who had been appointed by the Lancashire Committee as the Cotton Commissioner for India to act as a liaison officer between the general raw cotton interests in India and the Lancashire Committee. Early in May, however, Mr. Fleming died, having done much useful work during the short period he was in India. His place has since been taken by Mr. H. C. Short.

In Lancashire itself, concerted measures were taken by the Lancashire Indian Cotton Committee to educate the cloth merchant, the manufacturer and the spinner that it was in their interests to play their respective parts in the campaign for increasing the consumption of Indian cotton in Lancashire. To bring these different interests into closer contact, information regarding the spinners using Indian cotton and the range and kind of yarns manufactured by them was compiled by the Committee and published. The Lancashire Committee further arranged at the British Textiles Exhibition held in the spring of 1934 at the White City, London, the finest and most comprehensive display that had ever been exhibited of yarn, fabrics, etc., made from Indian cotton.

There is no doubt that the efforts of the Lancashire Committee to increase the consumption of Indian cotton in the United Kingdom will be watched with keen interest both in England and India. The following figures showing the total takings of Indian cotton by the United Kingdom during the last three years have recently been published by the Lancashire Committee :—

	Season 1933-34. Bales.	Season 1932-33. Bales.	Season 1931-32. Bales.
Total	355,534	242,601	122,082

THE COTTON TRANSPORT ACT.

18. In 1923, the Government of India, at the request of the Indian Central Cotton Committee, passed the Cotton Transport Act which enables Local Governments to prohibit the import of cotton into any area within their jurisdiction. The Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior strains.

19. *MADRAS.*—The object of the Act has not been fully realized owing to the absence of restrictions on the movement of cotton by road and river. Cotton from the Cocanadas tract and the Nizam's Dominions continues to enter the districts of Kurnool and Bellary ; Mysore and Malabar cottons find their way into Tiruppur. As the transport of cotton by road and river cannot be effectively checked without considerable expense, no legislative restrictions have been contemplated for the present.

Southerns Tract.—The amalgamation of the Tiruppur and Tinnevelly areas continues to reduce considerably the benefits that should have accrued from the working of the Act. The import of cotton from the Central Provinces into this tract has, however, been effectively checked.

Northerns and Westerns Tract.—The change of the northernmost limit of this tract from Cumbum railway station to Chelama railway station has checked to some extent the import of Cocanadas cotton into the Nandyal market. Inferior cotton, however, continues to be transported by road from H.E.H. the Nizam's Dominions.

20. *BOMBAY.*—There was no change in the seven protected areas notified in the Bombay Presidency. During the year under report, the Government of Bombay amended the Government Notification relating to the Nerbudda-Mahi Zone as a result of which no license is now required for booking cotton from stations lying in State territories to stations in British territory within the Zone.

21. There was no change in the protected areas in Baroda, Rajpipla and Chhota Udepur States. Sangli continued with the Bombay Rules which were introduced into the State from 1st July 1930.

22. *CENTRAL PROVINCES.*—No change was made in the protected area in the Central Provinces and Berar.

23. *INDORE.*—There was no change in the protected area. The question of approaching the Indore Darbar for the re-imposition of the restrictions under the Indore Cotton Transport Act to all cottons instead of the *Deshi Mewadi* cotton only, to which a reference was made in last year's report, was not pursued further owing to the reluctance of the Indore cotton trade to the proposed measure.

24. *HYDERABAD.*—The areas protected under the Hyderabad State Cotton Cultivation and Transport Act remained unchanged during the year.

THE COTTON GINNING AND PRESSING FACTORIES ACT (XII OF 1925).

25. During the year a few cases of infringements of the Act were reported to the authorities concerned and in almost all cases warnings were given to the factory-owners concerned.

The East India Cotton Association brought to the notice of the Committee that bales were being tendered bearing the calendar year as the year mark instead of the cotton year and that this had led to the rejection of such wrongly-marked bales in accordance with the Association's by-laws, causing thereby much inconvenience and financial loss to the traders handling such improperly marked bales. The comparatively large number of bales found to be thus incorrectly marked seemed to indicate the existence of some misunderstanding regarding the correct manner of putting the year mark on bales ; all Provincial and State authorities were accordingly instructed to bring to the notice of factory-owners the correct procedure and to warn them at the commencement of each cotton season.

26. Legislation for the marking of bales and the submission of weekly press returns is now in force in the following States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Bikaner, Bundi, Cambay, Chhota-Udepur, Cutch, Datia, Dewas (Junior), Dhar, Dhrangadhra, Faridkot, Gondal, Gwalior, Holkar State (Indore), Hyderabad (The Nizam's Dominions), Idar, Jaipur, Jamkhandi, Jaora, Jasdan, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kishangarh, Kolhapur, Kotah, Lakhtar, Limbdi, Malerkotla, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Palitana, Patiala, Porbandar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayla, Shahpura, Tonk, Wadhwan, Wankaner and Western India States Agency.

All these States, with the exception of Gwalior, supplied weekly returns for cotton pressed during the year.

LICENSING OF GINNING AND PRESSING FACTORIES.

27. Being convinced of the necessity of licensing ginning and pressing factories as the only effective remedy for the various malpractices which were responsible for lowering the reputation of Indian cotton, the Committee, as stated in last year's report, requested the Government of India to amend the Cotton Ginning and Pressing Factories Act, by the addition of a clause

empowering the Local Governments to introduce the system of licensing ginning and pressing factories with the permission of their respective Legislative Councils. The matter is still under the consideration of the Government of India but in the meanwhile the following further developments have taken place :—

In March last a representation was received from about forty leading cotton merchants and firms in Bombay drawing the attention of the Committee to the prevalence of the malpractice of watering and suggesting the amendment of the Cotton Ginning and Pressing Factories Act for the introduction of licensing gins and presses so that any press-owner who waters or allows to water or assists in watering raw cotton before pressing will be liable to fine or have his license suspended temporarily or permanently.

The Central Provinces Board of Agriculture, at its meeting held in March 1934, passed a resolution requesting the Local Government to approach the Government of India for the introduction of a system of licensing all ginning and pressing factories in the interest of growers, as, in the Board's opinion, the grower of long-staple cotton could not reap the full premium unless steps were taken to prevent the adulteration of his produce and to check malpractices which bring into disrepute the cotton of any tract.

The Bombay Millowners' Association and the Bombay Chamber of Commerce addressed the Government of India urging them to amend the Cotton Ginning and Pressing Factories Act at the earliest opportunity so as to provide Local Governments with powers to introduce a system of licensing ginning and pressing factories for the purpose of preventing malpractices. The Indian Merchants' Chamber, Bombay, also addressed the Government of India expressing itself as not being opposed to the principle of legislation but emphasising the necessity of consulting all interests affected before legislation was passed.

As decided by the Local Sub-Committee a conference of representatives of the Bombay Millowners' Association, the East India Cotton Association, the Indian Merchants' Chamber, Bombay, and the Bombay Chamber of Commerce was convened by the Vice-President of the Committee, Sir Purshotamdas Thakurdas, in August 1934, for drafting a resolution, which was adopted by the Indian Central Cotton Committee at its meeting held in the same month. The resolution reminded the Government of India of the Committee's resolution of 1933 and drew their attention to the dangerous increase in the evil of watering which called for immediate action in the interest of Indian cotton.

MALPRACTICES.

28. The East India Cotton Association reported during the year six cases of bales having been rejected for containing watered cotton. These bales came from Coimbatore, Amraoti, Arvi, Telhara, Akot (Berar) and

Warud (Central Provinces). Certified copies of entries in the press registers were called for under section 3 (3) of the Cotton Ginning and Pressing Factories Act and the information supplied was communicated to the East India Cotton Association.

A report was received by the Committee that certain presses in Broach had installed overhead water sprinklers and humidifiers for watering cotton and the Committee decided to distribute in the respective districts pamphlets on the evil effects of watering on cotton.

A case of false packing was reported—the bales being pressed in a factory at Hubli. A certified copy of the entry in the press register was called for and the information received was conveyed to the East India Cotton Association.

More than half a dozen cases of careless ginning were brought to the notice of the Committee. Two cases of admixtures and impurities in cotton were reported by the Karachi Cotton Association, and one case by a Karachi firm regarding oil spots in cotton.

Two complaints were received from the Lancashire Indian Cotton Committee regarding the presence of oily patches and seed in Indian cotton. The International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester, also reported two complaints received from Germany regarding oil spots in Indian cotton. All these cases were reported to the provincial authorities concerned and the press-owners were advised to instruct their workmen to be more careful in future.

Two important cotton exporting firms reported to the Committee the prevalence of the malpractices of the watering of cotton, the mixing of seed with lint, the cheating of cultivators by the payment of lower prices for their *kapas* after their carts had been unloaded in factory compounds and by the use of incorrect weights. These reports were duly forwarded to the Government of India with the object of ascertaining from them what they proposed to do to prevent these and similar abuses.

COTTON MARKETS.

29. The establishment of a cotton market at Amalner, which as mentioned in the last year's report received the approval of the Bombay Government, has since been notified and the Revenue authorities are taking necessary action to put the market in running order. The position regarding the Malegaon market remains unchanged. The question of the establishment of a cotton market at Bijapur is now under consideration.

The Gujerat Divisional Board of Agriculture at its meeting in June 1934 passed a resolution requesting the Government of Bombay to establish regulated cotton markets at Surat and Broach.

The Sind Cotton Committee has addressed the Presidents of District Local Boards regarding the possibility and utility of establishing regulated cotton markets in Sind under the Bombay Cotton Markets Act. In the opinion of the Chief Agricultural Officer in Sind, the establishment of regulated cotton markets in Sind can only take place to any real extent subsequent to the improvement of internal communications in the main cotton-growing areas in the Barrage zone. This matter is receiving the attention of the authorities concerned.

Rules have been framed under the Central Provinces Cotton Markets Act, and Draft Rules under the Madras Commercial Crops Markets Act have been published.

Indian States are also gradually recognising the advantages of regulated open markets and are not far behind the provinces in this respect. The Baroda Darbar recently enacted the Baroda Agricultural Produce Markets Act for the establishment of open markets for the purchase and sale of agricultural produce. The Act has at present been made applicable only to the Amreli Taluka with a view to the establishment of a cotton market at Amreli. Sangli, one of the Southern Maratha States, has introduced in the State Assembly a General Markets Bill which is still in the committee stage but the Darbar has, in the meanwhile, promulgated a Huzur Order regulating the Sangli market. The Huzur Order applies to all commodities including cotton.

UNIVERSAL STANDARDS FOR INDIAN COTTONS IN INDIA.

30. As stated in last year's report, a Standards Sub-Committee was appointed by the Committee consisting of five members, one representing the Imperial Council of Agricultural Research, two the East India Cotton Association and two the Karachi Cotton Association, to prepare, to begin with, standards for Bengals, Sind, Punjab-American and Sind-American cottons which are common both to the East India and the Karachi Cotton Associations. The Sub-Committee, as constituted above, met twice in Bombay during January 1934, and decided that, besides preparing standards for the four varieties of cotton mentioned above, standards should also be prepared for Oomras, Mathias, Dholleras, Broach and Kumptas which are dealt with only at Bombay. The growths of the cottons to be used in preparing the standards were also settled. The following are the descriptions of the standards decided on :—

1.	Bengals	Fully Good, Fine and Superfine.
2.	Sind	Fine, Superfine and Extra Superfine.
3.	Punjab-American ..	Fully Good to Fine, Fine and Superfine.
4.	Sind-American	Fully Good to Fine, Fine and Superfine.
5.	Oomras	Fully Good, Fine and Superfine.
6.	Mathias	Fully Good, Fine and Superfine.
7.	Dholleras	Fully Good, Fine and Superfine.

8. Broach .. .. .. Fully Good, Fine and Superfine.
9. Kumptas .. .. .. Good, Fully Good, Fine.

The constitution of the Standards Sub-Committee was modified as follows by the Committee at its meeting in August 1934 :—

(i) When standards for such cottons as are dealt with by both the Karachi and East India Cotton Associations are to be passed by the Standards Sub-Committee of the Indian Central Cotton Committee, two representatives each of both these Associations and one representative of the Imperial Council of Agricultural Research will constitute the Standards Sub-Committee. These standards will be prepared at Karachi.

(ii) When standards for such cottons as are dealt with by only one of the two Associations are to be passed by the Standards Sub-Committee, the representatives of the Association not concerned in that growth will be replaced by two representatives of cotton growers of the cotton tract concerned. The appointment of these two representatives will be made by the Indian Central Cotton Committee on the recommendation of the Directors of Agriculture of the provinces concerned but if it be not possible to appoint two cotton growers for any tract, one person representing cotton marketing interests may be appointed in place of one of the cotton growers.

A set of the standards passed by the Standards Sub-Committee every year will be preserved by the Indian Central Cotton Committee in hermetically sealed boxes for reference in case of dispute.

INTRODUCTION OF COMMON UNITS OF WEIGHTS FOR COTTON TRANSACTIONS.

31. Since 1930 the subject of standardisation of weights for cotton transactions has been engaging the attention of the Committee and in February 1933 the Committee decided to invite the views of provincial Governments on the possibility of the introduction of common units of weights within provinces and as between different provinces. After considering the replies received, the Committee came to the conclusion that the Railway *maund* of 82⅔ lbs. and the Bombay *khandy* of 784 lbs. were the most suitable units of weights for standardisation in cotton transactions. These units were accordingly suggested to Local Governments and the cotton-growing Indian States for adoption with the further recommendation that efforts should first be concentrated on the elimination of all unauthorised *maunds* and *khandies*. A considerable measure of success has attended the Committee's efforts. The United Provinces and the Central Provinces have accepted the Committee's recommendations in full ; Bombay and the Punjab have prescribed the railway *maund* of 82⅔ lbs. and Madras the *khandy*

of 784 lbs. As the advantages of standardisation to growers are further realised, it is hoped that a greater measure of unification will be possible in the not distant future.

Replies from the States addressed have not yet been received.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

32. *The Mexican Boll-weevil* (*Anthonomus grandis*).—The restrictions imposed by the Government of India in 1925 on the import of American cotton into India continued in force, without change, during the year under review. American cotton can be imported into India only through the port of Bombay, and that too, only after fumigation with hydrocyanic acid gas. As stated in paragraph 16, imports of American cotton fell off considerably during the season and only 22,499 bales were fumigated during the year as against 65,446 bales fumigated in the previous year. A rebate of fumigation fees at the rate of 11 annas per square bale and 7 annas per round bale on all American cotton fumigated during the year ending 31st March 1933 was sanctioned by the Government of India and paid to importers in April and May of 1934.

It was reported last year that the Committee had recommended a suitable reduction in fumigation fees. These recommendations have since been accepted by the Government of India, and the fumigation charges have been, with effect from the 1st April 1934, and as an experimental measure for a period of two years in the first instance, reduced from Rs. 3-1-0 to Rs. 2-8-0 per square bale and Re. 1-13-0 to Re. 1-8-0 per round bale. Another concession made during the year under report is the abolition of the distinction between " sample bales " and ordinary bales. It is now possible, under certain conditions, to get small consignments of a few bales fumigated at the ordinary rate of Rs. 2-8-0 per square bale and Re. 1-8-0 per round bale instead of Rs. 10-0-0 per square or round bale.

33. *The Red* (*Sudan*) *Boll-worm* (*Diparopsis castanea*) *and other pests.*—The restrictions placed on the import of foreign cotton seed under Government of India Notification No. 1213-Agri., dated the 27th May 1930, in the Department of Education, Health and Lands, and the entire prohibition of the import of foreign *kapas* (unginned cotton) under Government of India Notification No. 897-Agri., dated the 24th July 1925, remained in force throughout the year. Under these regulations ten parcels of cotton seed were received for examination and fumigation during the year.

COTTON STATISTICS.

34. *Cotton forecasts.*—The publication at Bombay of cotton forecast figures at the same time as they are published at Calcutta was continued without change.

35. *Improvement in the accuracy of cotton forecasts.*—One of the subjects tackled by the Cotton Forecast Improvement Sub-Committee was the detailed examination of the forecasted crop of 1932-33 season in the light of information as to the probable amount of cotton actually produced in each trade block available at the end of the season from various statistical returns. As a result of this examination, the Sub-Committee recommended that the standard yield figures for cotton used in Sind were low and required revision and this recommendation has since been given effect to. Other suspected sources of error in the compilation of Provincial and State forecasts have also been brought to the notice of the authorities responsible for their compilation and publication.

36. *Bombay Cotton Forecast Improvement Scheme.*—Also, on the recommendation of the Cotton Forecast Improvement Sub-Committee, the Indian Central Cotton Committee sanctioned, for the Bombay Presidency, for a period of two years in the first instance, a scheme providing the pay and other charges of an experienced whole-time officer for effecting improvements in cotton forecasting work carried on in the office of the Director of Agriculture, and collating all available statistical and other data relevant to the subject. The estimated cost of the scheme is Rs. 10,694. The scheme started work on the 16th June 1934.

37. *Trade classification of Indian cottons.*—The Cotton Forecast Improvement Sub-Committee also considered in detail the proposals made by the East India Cotton Association for a revised trade classification of Indian cottons to be adopted in future all-India cotton forecasts and suggested certain minor modifications, some of which have since been accepted by the East India Cotton Association, and others are still under their consideration. It is hoped that, with the co-operation of the Commercial Intelligence and Statistics Department, the various Agricultural and Revenue Departments, the Provincial and State authorities responsible for the compilation of cotton forecasts and the trade, it would soon be possible to adopt in cotton forecasts a trade classification which would be acceptable and useful to all concerned.

38. *Extra factory or village or domestic consumption of cotton.*—Mention was made in last year's report of the efforts made by the Committee to ascertain by local inquiries the quantity of raw cotton used annually in India for domestic purposes. During the year under report the Punjab, Baroda and Bombay inquiries were completed and the inquiries in Bengal, Madras, United Provinces and Sind commenced. The inquiry in the Central Provinces sanctioned last year and that in the Hyderabad State sanctioned by the Committee during the year under report will be commenced only in September and October 1934 respectively.

39. *Annual Census of Stocks of Raw Cotton.*—It was reported last year that the Committee had been successful in enlisting the co-operation of

several trade bodies and mills in arranging for an annual census of stocks held by the trade and the mills on the last day of the season, viz., the 31st January for South India and the 31st August for the rest of India. As the results of the census conducted in South India through trade associations of stocks held by the trade on the 31st January 1934 were not quite successful, it has since been decided to arrange for the census in this area through the Agricultural Department. A fresh source of information regarding stocks was also tapped during the year under report. The various Cotton Market Committees of the Central Provinces, Berar, Bombay, Hyderabad, Gwalior and Indore were requested to arrange for such census in their respective areas. The Committee is glad to record that most of them readily consented to co-operate. The Committee's thanks are due to these Market Committees as well as to the trade bodies and the mills for their continued and valued co-operation in the matter. A consolidated statement showing the total stocks held in India on the 31st August 1934 is given in *Appendix IV*.

40. *Raw Cotton Trade Statistics.*—Reference was made in last year's report to the request made to the Government of India to arrange for separate trade statistics for loose cotton. The Government of India have since acceded to the wishes of the Committee, and arrangements have been made with effect from November 1933 to maintain separate statistics relating to the rail and river-borne trade in loose cotton.

41. *Imports of American cotton.*—The Committee continued to issue weekly circulars giving the purchases for mills of American cotton, the arrivals at Bombay, and the quantity at sea for India. Importers and millowners of Bombay continued to furnish confidentially information regarding their purchases of American cotton, and the Committee once again wishes to record its thanks to them for their valued co-operation.

42. *Demand for various types of Indian cotton.*—As in previous years the inquiry relating to the receipts at mills and the exports from India of various types of Indian cotton was undertaken towards the close of the season. It is very gratifying to record that the response from mills and exporters to the Committee's request for information on this point was highly satisfactory, and that the figures obtained are more complete than in previous years. A statement showing the results of the inquiry is given in *Appendices V and VI*.

43. *Staple Length Report.*—Immediately following the publication of the final (April) forecast of 1933-34 season a leaflet (Statistical Leaflet No. 1) showing the estimated production, during the season, of Indian cotton of different staples was issued, for the first time in the history of Indian cotton statistics. Though this publication was meant for the information of foreign buyers of Indian cotton, it is hoped that the information contained in the leaflet would, to quote the words of Sir Purshotamdas Thakurdas' Foreword to this leaflet, " enable the public to view the subject," viz., the problem of marketing Indian cotton, " in its approximately correct perspective."

44. *Cotton consumption.*—The compilation and publication of the monthly statements (*Appendix III*) (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States, (3) of loose cotton received in the mills in the major cotton-growing provinces and (4) a consolidated statement of (1) and (2) especially meant for publication in the daily Press, was continued.

COLLECTION AND SUPPLY OF INFORMATION.

45. As in the past, notes* on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee, were contributed to the Bombay Cotton Annual published by the East India Cotton Association.

PUBLICITY AND PROPAGANDA.

46. The Annual Report of the Publicity and Propaganda Officer for 1933-34 will be found in Chapter VI of this report. The Publicity and Propaganda Department was started in 1932 with a view to give wide publicity to the Committee's work, and the above report bears evidence of the wide appreciation of its services in India and abroad and the growing volume of its activities. The work of the year comprises field and Press propaganda and publicity by means of Press *communiqués*, pamphlets, brochures, leaflets, exhibitions and illustrated posters. The Publicity and Propaganda Officer toured through the important cotton-growing areas in the Bombay Presidency popularising cotton cultivation in the Barrage areas of Sind and the Jayawant cotton in the Southern Maratha country and furthering the clean-up campaign in Gujerat for the removal, immediately after harvest, of all cotton stalks and stubbles to check the boll-worm pest.

That these campaigns have been so remarkably successful was evident at the last half-yearly meeting of the Committee when several members from different parts of the country spoke in appreciative terms of the valuable work of the Publicity and Propaganda Officer.

The Publicity and Propaganda Officer issued 22 Press *communiqués* dealing with experiments carried on in the Hyderabad State and at the Technological Laboratory, Matunga, entomological research in the United Provinces, botanical research in the Punjab and the results obtained from several other schemes functioning during the year. Three pamphlets on the life-history of the spotted boll-worm in South Gujerat and on the improved type of 4F-18, a Punjab-American variety, and a fully illustrated brochure entitled "The Indian Central Cotton Committee, its objects, activities and achievements, with special reference to the Punjab, Sind, the United Provinces and Central India were likewise published. Also a series of leaflets dealing with the economic results obtained from some of the research schemes and two large coloured posters, one representing the benefits of cotton cultiva-

* *Appendix VII.*

tion in Sind and the other the economic superiority of Jayawant cotton in the Dharwar district were issued. In addition, the Publicity and Propaganda Officer participated in person in the Indian Empire Exhibition held in December 1933 at Lahore and in the All-India Khadi Exhibition held at Bombay in April 1934 besides sending publicity and propaganda materials to other exhibitions.

PUBLICATIONS.

47. The Committee subscribes to a number of important scientific and technical journals and these are circulated to research workers and institutions of the Committee. This scheme of circulation, while effecting economy by preventing duplication of journals and periodicals purchased out of the Committee's funds, affords the workers in the *mofussil* an opportunity of perusing varied and up-to-date scientific literature, which otherwise would not be available for them.

48. The name of the Committee is on the free mailing list of a number of private and public institutions, and to them the thanks of the Committee are due. Particular mention should be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, the Empire Cotton Growing Corporation, the British Cotton Growing Association, the East India Cotton Association and the Karachi Cotton Association for the supply of their publications for distribution to Committee members. The Committee has also to record its thanks to the Indian Trade Commissioner, London, the United States Department of Agriculture, the Egyptian Ministry of Agriculture, Technical and Scientific Service, the Liverpool Cotton Association and the Imperial Bureau of Plant Genetics, Cambridge, and other Associations and Chambers of Commerce which supply it with reports, statistics and other literature from time to time. The Committee's name has been recently placed on the free exchange list of the Imperial Council of Agricultural Research, the Imperial Institute of Agriculture Research, Pusa, and of the Director-General of Commercial Intelligence and Statistics, Calcutta.

49. The following publications were issued during the year :—

(1) Estimated production and distribution of the various types of Indian Cotton. (Statistical Bulletin No. 3.)

(2) Report on the staple length of the Indian Cotton Crop of 1933-34 season. (Statistical Leaflet No. 1.)

Technological Bulletins and Circulars published during the year will be found in the Report of the Director, Technological Laboratory, which forms Chapter V of this Report, and in Chapter VI of the Report the publications of the Publicity Department are mentioned.

SECRETARY'S TOURS.

50. During the year under review the Secretary visited Madras, Coimbatore, Indore and Baroda in connection with the work of the Committee.

FINANCIAL.

51. In *Appendix VIII* will be found a statement showing the Receipts and Expenditure of the Committee and also the Balance Sheet for the year ending 31st March 1934. Receipts amounted to Rs. 7,22,796 and expenditure to Rs. 9,42,987. The estimated expenditure for the year was Rs. 12,34,925, the principal items of savings being as under :—

Administration (Rs. 40,857), Improvement of Cotton Marketing (Rs. 16,941), Seed Distribution and Extension Schemes (Rs. 61,820 —three schemes sanctioned were held in abeyance), Printing and Propaganda (Rs. 5,642), Statistical Research (Rs. 17,037), Technological Research (Rs. 1,56,442), Research Studentships (Rs. 5,546), Surat Boll-worm Clean-up Scheme (Rs. 27,797), Pempheres and Physiological Scheme (Rs. 11,964), Punjab Botanical Scheme (Rs. 34,904), Punjab Entomological Scheme (Rs. 3,789), Punjab Physiological Scheme (Rs. 4,291), Punjab Defibrating and Delinting Scheme (Rs. 4,462), Central Provinces Botanical Scheme (Rs. 13,180), Sind Physiological Scheme (Rs. 5,127), Hyderabad Research Schemes (Rs. 6,955), Bikaner Gang Canal Scheme (Rs. 4,024) and Bengal Comilla Scheme (Rs. 3,085). In the current year receipts are estimated at Rs. 6,22,500, and expenditure at Rs. 13,78,021. As a result of new schemes sanctioned during the year, very considerable inroads will have to be made on the Committee's accumulated balances.

ROYAL ASIATIC SOCIETY LIBRARY OF THE BOMBAY BRANCH OF THE

CHAPTER III.

RESEARCH.

52. ONE of the important functions of the Indian Central Cotton Committee is to provide funds for the improvement and development of the growing, marketing and manufacture of cotton in India. The Committee carries out its research policy by direct control of the Technological Laboratory, Matunga, and by granting subsidies to Departments of Agriculture in Provinces and States for the investigation of problems, mainly of economic importance. The Committee also makes large contributions to the Institute of Plant Industry, Indore, where the questions of fundamental, economic and agronomical importance are under investigation. The problems dealt with in Provinces and States include several schemes—botanical for obtaining high yielding superior types of cotton, physiological for the investigation of crop growth and bud and boll shedding, entomological for the study of the life-history of certain cotton pests and the measures to combat them and mycological to prevent loss due to wilt and root rot diseases. The Committee, in addition, promotes the extension and marketing of improved varieties of cotton by providing liberal grants to Agricultural Departments and Co-operative Cotton Sale Societies and it has also undertaken, jointly with the Imperial Council of Agricultural Research, the economic inquiry into the cost of the cultivation of cotton, sugar-cane and their rotation crops in the principal cotton and sugar-cane tracts of India. The Committee thus provided funds in 1933-34 amounting to Rs. 4,26,587 for research and seed distribution and marketing schemes, besides a further sum of Rs. 3,38,851, sanctioned for the Technological Laboratory, Matunga, the Institute of Plant Industry, Indore, and the economic inquiry into the cost of cotton and sugar-cane cultivation. The propaganda work, started in 1931 on a small scale to prevent the carry-over of the Spotted Boll-worm in the Surat area of the Bombay Presidency, took an important turn in the middle of 1932 when, as a measure of experiment, a whole-time officer was temporarily appointed for a period of three years to carry on publicity and propaganda on the Committee's work. The activities of this new scheme have been so fruitful during the past two years that the Committee at its last meeting, held in August 1934, decided to continue it as one of its adjuncts. The Committee also offers scholarships and training grants for post-graduate training in India and abroad in subjects pertaining to Cotton Industry. All schemes, including scholarships and training grants, are first examined critically and approved by the Agricultural Research Sub-Committee before they are finally sanctioned by the full Committee which keeps itself in close touch with the progress of work by means of the annual reports submitted by officers in charge of them.

TECHNOLOGICAL LABORATORY.

53. The Annual Report of the Director, Technological Laboratory, forms Chapter V of this report. The work of the Laboratory continued to expand in all directions and the year under report establishes a new record in the number of samples, lots and yarns spun. The number of samples rose to the high figure of 548 which represents an increase of nearly 20 per cent. over the last year's figure which was itself a record. A similar increase was witnessed in the number of lots, but the number of yarns spun increased by 26 per cent. The samples tested fell, as usual, under four heads, viz., (*i*) agricultural samples, (*ii*) standard cottons, (*iii*) trade samples and (*iv*) technological samples. The agricultural samples represent new selections and cottons grown in connection with research problems and comprise 67 per cent. of all samples tested during the year. The standard cottons consist of improved varieties which are being grown on commercial scale, e.g., *Verum* 262, *Jayawant*, *Co.* 2, etc. Ten such varieties were tested during the year and the results were published in four-page circulars, as usual. One of the chief objects of these tests is to find out a statistical formula for the prediction of the spinning value of a cotton from its fibre properties. The trade samples represent the main types of commercial Indian cottons and the first arrivals of the new crop of cotton of a season and their tests are meant for providing the trade and mill industry with reliable information regarding their waste losses and spinning value. Tests on these samples are usually carried out immediately on their arrival at the Laboratory and the results are published in the shortest time possible in two or three page circulars. During the year under report 45 such samples were tested and their results were published. The technological samples are the samples of cotton spun in connection with certain research problems relating to the conversion of cotton fibres into yarn.

The special tests were continued on *Banilla* cotton for finding out changes, if any, in the quality of this cotton when grown in the cultivators' fields in Khandesh and much progress was made in the investigations into the causes of deterioration of cotton stacked in open plinths at Karachi. A new experiment was started for the verification of the belief held by a large section of the trade that Broach cotton deteriorates more rapidly and to a greater extent than other cottons and three other experiments were also started for finding out (*i*) the effect of different degrees of compression in a bale, (*ii*) the effect on the quality of lint due to storage of *kapas* (seed cotton) before ginning, and (*iii*) the effect of prehumidification before pressing on cotton. In addition, ginning tests also were undertaken with a view to study the relationship between the conditions of ginning and the quality and degree of neppiness of yarns spun.

The work of the moisture testing section was mainly confined to testing samples drawn from trade bales as received in Bombay, for ascertaining the average moisture content in the main types of Indian cottons.

INSTITUTE OF PLANT INDUSTRY, INDORE.

54. The Annual Report of the Director of the Institute of Plant Industry, Indore, will be found in *Appendix II* of this report, which may be referred to for details of work done during the year. The Institute was started in 1924 as a central research station for cotton. It is maintained by the funds contributed by some of the States in Central India and Rajputana and the Indian Central Cotton Committee, the total contributions of the States up to the 31st March 1934 being Rs. 2,99,904 as against Rs. 12,21,344 contributed by the Committee. The original programme of the Institute includes the general botany, physiology and genetics of cotton, besides a number of agricultural investigations connected with cotton cultivation in Central India. The first seven years were, however, devoted, almost exclusively, to agronomical problems, such as clean cultivation, field grading, surface drainage and compost making and the cumulative effect of all these improvements is now seen in the general increase of the yield of cotton on the Institute farm. More attention is being paid, since 1931 when the past work of the Institute was reviewed and its original programme was reaffirmed, to fundamental research and the improvement of local and American cottons. Two pure strains of *Malvi* cotton have been finally selected for their high yielding and superior lint characters and of these, one has been distributed to the cultivator for the 1934-35 season and the other is being further propagated for distribution later on. *Banilla* (cross between *Bani* and *Comilla* cottons), failed to maintain the promise of the previous year in the Nimar tract of Central India and work has been started for the selection of suitable types for this area from the local mixture and acclimatised American cotton. The botanical survey of cottons grown in India has been modified in the light of the past experience and of the large amount of information gathered in Trinidad on these cottons. A plant derived from an irradiated cotton seed has been discovered to contain more than the normal number of chromosomes and its progenies are being tested with a view to finding out recessive morphological changes which might have taken place. Cytological work has been undertaken on hybrids between wild African cotton and cultivated Asiatic cottons and on the progeny of a sterile plant which occurred on an interspecific cross and the study of the genetics of lint length and ginning percentage has been included as part of a larger investigation into the inheritance of quantitative characters. Leaf roll and Red Leaf disease on American cotton have been traced to soil conditions and the biochemical investigation of cotton wilt is under progress.

GRANTS-IN-AID.

SCHEMES IN PROGRESS IN PROVINCES AND STATES.

MADRAS PRESIDENCY.

55. *Herbaceum Scheme.*—This scheme was started in 1923 with the object of securing suitable selections from local *Uppam* (*G. herbaceum*) equal

to *Karunganni* (*G. Indicum*) in yield and spinning qualities, when grown under similar conditions in black soils of the Salem and Coimbatore districts where the rainfall is low and precarious. In years of good rainfall *Karunganni* gives a much higher yield than *Uppam* while in bad years the position is reversed, *Uppam* being a more hardy variety than *Karunganni*, capable of giving a fair yield even under adverse conditions. The cultivator often meets the situation by growing a mixture of the two cottons. The *Karunganni* strains which are being distributed by the Department of Agriculture are capable of spinning up to 26's standard warp counts against 14's of *Uppam*. The chief aim of the scheme is, therefore, to obtain by selection high yielding *Uppam* strains which could spin at least up to 20's to replace the mixture. It was, however, realized after seven years' work that the chances of getting pure strains from *Uppam* that would come up to the standard were few and the Committee, therefore, extended the scheme in 1930 for a period of five years for securing suitable hybrid types.

The report for the year shows that none of the interspecific crosses which had *herbaceum* as one of the parents has proved a success, while, however, natural crosses and also crosses between *indicum, neglectum and obtusifolium* look promising. Out of the five biotypes that were selected last year from the *F4* generation of a cross between *indicum* and *cernuum*, recrossed with an *Uppam* type, the best three were examined for purity in seed and lint weights and none of them was found to be pure for these characters. Fresh selections have been made from some of their progenies for further testing. Some of the cultures of the X-rayed families look a little hopeful, though the degree of their increase in yield over the control is much lower than what was obtained in the previous year. This may be symptomatic of the temporary effect of X-raying. The study of the inheritance of lint colour, seed and lint weight and the size of boll was continued and the results so far obtained show that in varieties under investigation, the lint colour is influenced by three genes.

56. *The Pempheres and Physiological Scheme* was first sanctioned in 1925 but due to the difficulty of securing the services of a competent plant physiologist, it was held in abeyance till 1930 when the Committee decided that two officers, selected from the Madras Agricultural Department, should be sent to England for post-graduate training in Plant Physiology and Biochemistry with a view to their eventually occupying the posts of Physiological Botanist and Bio-chemist under the scheme and that, pending their return, a beginning should be made with the preliminary work done under the guidance of the Cotton Specialist, Coimbatore. The scheme commenced in September 1931 when the two officers, Messrs. T. R. Narayanan and S. Kasinathan, were sent to England for training in Plant Physiology and Bio-chemistry respectively. The latter returned in August 1933 after successful training in London. Mr. Narayanan is expected back before the end of November 1934. The main object of the scheme is (*a*) to devise measures for the control of the cotton *stem borer* (*Pempheres affinis*), (*b*) to investigate bio-chemically the causes of the susceptibility of cotton plants

to this insect, and (*c*) to continue the work on bud and boll shedding which had been started by Mr. Hilson and suspended for want of a trained physiologist. The physiological part of the scheme, viz., the investigation of bud and boll shedding, has not yet commenced, pending the return of Mr. Narayanan. The work of the year on the remaining parts of the scheme shows that the adult borer continues to emerge from the pulled out cotton stalks for a period of two months and lives on weeds for about three weeks thereafter, suggesting thereby that one way of combating the pest is to have a close period of not less than three months between the old and the succeeding crop of cotton. Exposure of the pulled out stalks to the direct rays of the sun for a week or ten days is fatal to the insect in all its stages, but it is yet to be ascertained if this is a practical proposition. *Nadam* among the indigenous cottons and *Bourbon*, *Kidney* and Peruvian cottons among Americans are the least susceptible to the insect attack and also such of the Cambodia plants as have the capacity to exude gum into the larval cavity appear to be more tolerant than other plants. There is little or no relation between the incidence of attack and the amount of moisture in the soil or the degree of succulence in the plant.

57. *Fodder Cholam Scheme.*—This scheme started work in January 1931 with the object of ascertaining the causes of the harmful effects of *Cholam* (*Andropogon sorghum*) as compared with *Cumbu* (*Pennisetum typhoideum*) on the succeeding crop of cotton and devising means to overcome these effects in order that the cultivator of the Tinnevelly district might have his fodder without suffering any loss in the yield of succeeding cotton. The observations of the year under report indicate that the ill-effects of *Cholam* are not due to either the large quantities of its stubbles left in the soil or its heavy yield of fodder. The rate of percolation in *Cholam* soils is considerably low as compared with *Cumbu* soils and the deep ploughing of *Cholam* fields and exposing clods to the sun did not improve the yield of succeeding cotton. The conclusion arrived at in previous years that while *Cholam*, when allowed to run to seed, seriously affected the yield of succeeding cotton, no such adverse effect was noticed when it was cut at shot blade, was again confirmed and attempts are being made to find a way to get a large yield of *Cholam* fodder when cut at shot blade by either heavy manuring or growing it as a mixture with some bulky leguminous crop or by any other means.

58. *The Nadam Cotton Breeding Scheme* which commenced in June 1933 has for its object the selection of suitable annual types of cotton to replace the perennial *Nadam* cotton (*G. obtusifolium*) which is now commonly grown on the rainfed, light red soils of the Salem and Coimbatore districts. This cotton, due to its long duration, serves, during the off-season of Cambodia, as a convenient breeding ground for the insects that infest the latter cotton and against which the Pest Act has been brought into force. The importance of the scheme will be seen from the observations recorded during the year that while, due to the *Stem Borer* pest, the mortality in Cambodia fields, far away from the *Nadam* area, was even less than 1 per cent., it was as high as 25 per cent. in fields surrounded by *Nadam*. The work of the year

mainly consists of testing the possibility of having a close period of about three months as in the case of Cambodia by sowing rainfed cottons in September instead of in July as at present and of obtaining annual strains to replace the *Nadam* cotton. The results obtained are hopeful. It has also been observed that, among the several varieties tested, the progenies of crosses between *Bourbon* and Uganda and between Cambodia and Uganda are very encouraging.

Bombay Presidency.

59. *Surat Boll-worm Clean-up Scheme.*—This is the outcome of the Surat Entomological Research Scheme which successfully terminated in 1931. It was sanctioned in December 1930 for the purpose of giving a practical demonstration over an area of 480 square miles in Gujerat so that better yield of cotton could be obtained by depriving the *Spotted Boll-worm* of its food supply by cleaning up the whole cotton area, immediately after the harvest, of all cotton stalks and stubbles and by eradicating alternative host plants. The scheme was put into operation in 1932, after an intensive propaganda of one year to secure the co-operation of the cultivator, and the results obtained are very encouraging. With the removal of cotton stalks and stubbles in May, the insect in the demonstration area was left with hardly any food material till the next crop was in fields and fresh infection did not, therefore, establish itself till about the second week of September when the crop was about 12 weeks old. This is in contrast to what was observed outside the demonstration area where for want of a close period the pest easily extended from the old crop to the new crop without any interval. The net result of the clean-up measures is that in spite of the unusually severe winter during the year under report, the yield obtained in the clean-up area exceeded by 25 to 30 per cent. the yield obtained outside this area in the previous season when record yields were obtained. The scheme was closed down in April 1934 but the Committee continues to finance, in its place, a new small scheme to popularise the cotton puller, a cheap and effective implement to pull out cotton plants.

60. *The Broach Cotton Breeding Scheme* commenced in April 1932 with the object of securing suitable types of cotton, capable of withstanding wilt and giving heavy yield, high ginning percentage and superior lint, for the Nerbudda-Mahi zone where about 800,000 acres are annually under cotton. Two crosses between *B.D.* 8 (a local strain) and *G.A.* 26 and between *B.D.* 8 and *G.E.* 5 have completed their third generation and 80 healthy and wilt-resistant plants with ginning outturn from 37 to 45 per cent. and staple length from 19 to 23 millimetres have been selected for purity tests in the next season. About fifteen of the most healthy plants of a first generation cross between *B.D.* 8 and (1927 × *W.* 8)-7-1 and about the same number of promising plants from a cross *B.D.* 8 and *G.A.* 26-*F*1, back crossed with *B.D.* 8, have also been selected for further tests. The selection *N.S.* 12 has kept up its uniformity for wilt resistance and ginning percentage.

61. *Jalgaon Cotton Breeding Scheme.*—This scheme, like the above, aims at obtaining, by selection or by hybridisation, a wilt-resistant, heavy yielding, high ginning and good spinning cotton to replace *Banilla* (a cross between *Bani* and *Comilla*) in the Khandesh area. Three promising strains, viz., *N.V.* 57-7, *N.V.* 56-3 and *N.V.* 56-17, which are superior, in fibre tests, to most of the other Jalgaon strains so far tested, have been selected for rigid yield trials in the next season. A large number of plants, selected during the last season for wilt resistance, were tested and the best thirteen of them have been selected for further examination. In variety trials, *Banilla*, though it yielded 19 per cent. less than the Farm Selection of *Neglectum Roseum*, proved once again more remunerative than the latter, owing to its high ginning percentage and better quality of lint.

62. *Small Leaf Disease Survey Scheme.*—This small scheme was sanctioned in August 1933 for the survey in Gujerat, including the Baroda State, and the Southern Maratha country of the disease known as small leaf disease in cotton, with a view to ascertaining if it was of sufficient importance for starting an investigation into its causes and finding out remedial measures. The important symptoms of the disease are the reduced size of leaves and floral organs. It attacks either the whole plant or only some parts of it. The affected parts are rendered sterile and the floral organs show teratological phenomena. The disease, though it varies in intensity from year to year, is of widespread occurrence in the Bombay Presidency and affects all varieties of *Herbaceum* cotton ; it does not attack the foreign varieties. The work of the year shows that at present the disease is not of great consequence except in the Kaira district where the cotton crop is ratooned. The cause of the disease is not known, and all attempts to transmit it to healthy plants by grafting, by the agency of insects and by the juice expressed from the diseased plants proved a failure.

63. *The Sind Physiological Scheme* commenced in July 1927 for the investigation of problems connected with the water requirements and general growth of the cotton plant under perennial irrigation. Particular attention was paid again this year to irrigation and manurial experiments and to the study of the " Red Leaf " disease. The irrigation experiment confirms once again the view that the water requirements of the cotton plant is the highest during the flowering and fruiting period. An initial irrigation of 8″ during the first 28 days followed in succession by two waterings of 3″ each at twenty days interval, two of 3″ each at 15 days interval and then five of 3″ each at 10 days interval has given the highest yield. The manurial experiment has given the best results when, in addition to $7\frac{1}{2}$ cartloads of compost before sowing, ammonium sulphate was applied, $1\frac{1}{2}$ months after sowing, at the rate of 50 lbs. per acre. The investigation of the " Red Leaf " disease has revealed the existence of three different distinguishable types of the disease, each differing in the incidence, symptoms, appearance and history of attack. The problem of the development of unsound seed in the Punjab-American varieties still remains unsolved.

PUNJAB.

64. *The Punjab Botanical Scheme* was started in 1925 with the double object of studying the causes of the periodic " failures " of American cotton and selecting a suitable strain which can replace 4*F* (American) cotton in Canal Colonies where a very large area is annually occupied by this cotton. The Botanist in charge produced, after five years, a strain which looked very promising, but due to its susceptibility to *Jassid* attack it had to be given up. Several new strains of American and *Desi* cottons have since been isolated and of them, four of American cotton, viz., *N.T.* 45-*F*, *N.T.* 43-*F*, *N.T.* 38-*F* and *N.T.* 36-*F*, and one of *Desi* have been finally selected for their superior characters. A large number of other pure line selections of American and *Desi* cottons were also tested during the year for various economic characters and the best two of them have been selected for further tests. The *F*3 generation of *N.T.* 15 (*Mollisoni*) × *Million Dollar* was studied and several promising plants have been selected for further examination. Several selections have been similarly made from the *F*2 generation of a cross between an early strain of American cotton and C.B.S. (*Barbarton*). The irrigation experiment is not of much interest this year owing to good and well distributed rains throughout the growing period. Manurial trials show once again that the end of August is the best time for the application of nitrogenous manures. Superphosphate and complete mixture of artificial manures did not give conclusive results. The sowing date experiment has once again confirmed the previous results that early May is best suited for sowing *N.T.* 43-*F* (an early variety) and the middle of May for 4*F*. Close spacings of 3″ and 6″ in rows gave better yields than 12″, 18″, 24″ and 30″ spacings.

65. *Entomological* (*Pink Boll-worm*) *Scheme.*—This scheme came into operation in 1926 for the purpose of ascertaining the reason for the difference in the incidence of the *Pink Boll-worm* (*Platyedra gossypiella*) between the South-East Punjab where its attack is severe and the Canal Colonies where it is negligible. It was continued till April 1934 when it was succeeded by a combined scheme for the inquiry of certain aspects of the *Spotted Boll-worm* (*Earias insulana and Earias fabia*) and for the continuation of work on the *Pink Boll-worm*. The work on the *Spotted Boll-worm* has not yet commenced and the results obtained during the year on *Pink Boll-worm* investigation once again confirm the results of previous years. Temperature and humidity are the main causes of the difference in the incidence of the *Boll-worm* between the two localities. The egg laying capacity of the insect is considerably increased when it was exposed during its pupal and imaginal stages to temperature from 72° to 90° F. and to humidity from 70 to 90 per cent. and the number of eggs laid by the insect was much diminished when either the temperature was lower than 72°F. or above 90°F. or when the relative humidity fell below 70 per cent. Adult males emerged from a mean temperature of 95° F. were devoid of fully developed sperms while those emerged from 81.4° F. were full of fertile sperms.

66. *The White Fly Scheme* commenced work in May 1931. White Fly is a sucking insect that does damage to cotton and other crops. The

most active period of the pest is from May to September when it migrates from cotton to alternative host plants like *Brassicae*, *Solanum tuberosum*, *Lycopersicum esculantum* and various weeds where it is carried over through winter. From March to May it extends to cultivated cucurbits and ratoon cotton and returns thereafter to new cotton on which it establishes itself once again. The attack is more severe, to begin with, on *Desi* cotton than on American cotton, and from July onwards its intensity diminishes on both cottons. No sign of injury is observed on the affected plant except that the infested leaves are blackened later on and that during the period of severe attack, the vegetative growth of the plant is checked almost entirely. The plant, however, regains its normal growth after the attack is over, especially if the attack begins early and does not extend over a long period. The chemical analysis shows some difference in the movements of nitrogen, ash contents, fat and carbo-hydrates in affected and unaffected plants. The attack seems to be more or less in inverse proportion to the quantity of water applied to the crop. Nitrogenous manures lessen, to some extent, the infection, bud and boll shedding and also bad opening of bolls. During the year under report, the pest was comparatively severe in July after which it declined considerably and a single spraying in July and in August gave an increase of about two maunds and half a maund of *kapas* per acre respectively over the yield of unsprayed crop while two sprayings, one in July and another in August, gave only slightly better yield than one spraying in July.

67. *The White Fly Spraying Scheme* is the direct outcome of the above scheme which has resulted in the discovery of certain insecticides which kill the White Fly without causing damage to the cotton crop. As, however, the results obtained from these insecticides on small-scale experiments were found misleading, due to the difficulty of preventing the insect from flying from the unsprayed plots to the sprayed plots, this supplementary scheme was sanctioned in August 1932 with the object of carrying out large-scale spraying experiments for ascertaining (*a*) the most suitable and economic insecticides and the proper time for its spraying or dusting, (*b*) the form in which the insecticide should be applied—dust or spray and (*c*) the various methods and appliances for spraying and dusting. The scheme commenced in July 1933. Rosin compound and rosin soap solutions were tried over an area of about 1,875 acres at Khanewal and Okara with Sapom sprayer, Hardie power sprayer and Orchard power sprayer each of which covered from 10 to 15 acres per day according to the nature of the standing crop. The cost of spraying, including all items of expenditure, viz., insecticide, labour, petrol, oil, depreciation and supervision, amounted to Rs. 1-5-4 per acre with rosin compound and Sapom sprayer when a single nozzle was used for one row of cotton. It however increased to Rs. 1-9-5 when two nozzles were used. The cost per acre with the Hardie power sprayer and rosin compound came to Rs. 1-9-2 while it went up to Rs. 3-1-10 with rosin compound and to Rs. 4-8-3 with rosin soap when sprayed with the Orchard sprayer. The mortality of the pest was 87 per cent. with the Orchard power sprayer, 84 per cent. with the Hardie power sprayer, and 70 to 79 per cent. with the Sapom sprayer.

An area of 10 acres was dusted at Khanewal with calcium cyanide and nicotine sulphate mixed with ordinary road dust and the mortality obtained was 36.2 per cent. with calcium cyanide and 32.7 per cent. with nicotine sulphate.

68. *The Root Rot Scheme* commenced in September 1932 for the investigation of *root rot* in the Punjab where, particularly in the Canal-irrigated areas, the damage done to cotton by this disease is estimated at Rs. 16 lakhs every year. The disease appears towards the end of June when the crop is about two months old and continues up to about the middle of September. The results of the investigations of the past two seasons show that, though several organisms are present in the affected parts of the roots, two species of *Rhizoctonia*, the systematic position and nomenclature of which are not yet definitely known, appear to be primarily responsible for the disease. Other organisms are by themselves practically harmless but when they are associated with the two, or even with any one of the two, *Rhizoctonia fungi*, the vigour of the attack is intensified. The parasitic activity of the two causal organisms reaches its maximum at 35° C. and tends to decline with the fall of temperature. Soil analysis does not show any chemical differences between the infected and healthy soils and the application of lime did not show any influence on the disease. A few plants that were found unaffected in the midst of the affected plants have been selfed and their progeny will be tested in the next season for *root rot* resistance. A virulent culture of the causal organism of the Texas *root rot* of cotton was tried on cotton plants, growing in pots and it failed to reproduce the disease.

Central Provinces.

69. *Botanical Scheme.*—This scheme was started in 1923 with the main object of securing wilt-resistant, heavy yielding and fine spinning types of cotton suitable for the Central Provinces and Berar. This scheme, unlike other schemes, had the advantage of the botanical work already started by the Department of Agriculture prior to its sanction and it was therefore possible to obtain much earlier than otherwise a good yielding wilt-resistant variety, *Verum* 262, which could spin up to 22's counts as against 8 to 10's counts of local cotton. This strain, because of its good yield and high premium paid for it, soon became so popular with the cultivator that the Committee in 1929 felt it desirable to sanction a seed distribution scheme with the help of which the Department of Agriculture have been able to spread this cotton more quickly than otherwise. This cotton, however, has since been found susceptible to adverse climatic conditions and two other pure strains of *Verum*, viz., *Late Verum* and *V.* 434, are now ready to take its place. These two strains were tested, during the year, under widely divergent conditions of soil and climate and in all cases the results exceed expectation. *Late Verum* is particularly suitable for localities where monsoon extends till late in the season and it is expected to cover an area of about 16,000 acres in the next season. It spins up to 34's and is also the best yielder of all new strains. *V.* 434, on the other hand, is specially recommended for localities

of short duration of the monsoon. It is drought and wilt-resistant and has good ginning outturn. It is next to *Late Verum* in yield and spins up to 32's. About 2,000 acres are expected to be sown to this cotton in the next season. *Bani E.B.* 31 and *Bani* 306 showed themselves capable of withstanding adverse climatic conditions. They are very good spinners but their ginning outturn is low and they are not, therefore, likely to become popular with the cultivator unless an adequate premium is paid for them. A few promising selections have also been isolated from *Chanda Jari* and *Buri* (*G. hirsutum*) cottons and they will all be further tested in the next season. Work on the breeding of new varieties of groundnut was continued. The new strain of groundnut *Ak.* 12-24 has proved again satisfactory under conditions obtaining in Berar and another new strain, *Ak.* 8-11, looks promising.

United Provinces.

70. *Cotton Survey Scheme.*—This scheme has for its object the detailed survey of the Bengal types of cotton grown in the different cotton tracts of the United Provinces to facilitate the selection of suitable types for different localities of the province. It commenced work in July 1933. Out of a total number of 2,791 cotton growing villages in the Budaun, Bareilly and Naini Tal Districts and in the Rampur State, no less than 1,852 villages were covered during the year and about 5,000 samples of cotton were collected. All these samples were subjected to a critical examination and the best 404 of them have been retained for future tests. From the samples examined, it was noticed that cotton grown in the above three districts and the Rampur State was a mixture of the several forms of *G. neglectum*, the narrow-lobed and yellow-flowered type predominating everywhere. The other types present were, in order of their numerical strength, narrow-lobed and white-flowered, broad-lobed and white-flowered and broad-lobed and yellow-flowered forms. A particular type of new plant, with external characters of *G. neglectum* and with better fibre length, was noticed throughout the area surveyed and it will be tested for its purity.

Burma.

71. *Cotton Improvement Scheme.*—The Department of Agriculture has a few improved strains of cotton but the methods of local agriculture are so backward that unless they are first improved the distribution of new strains is of little consequence. The aim of the scheme is, therefore, to bring home to the cultivator, by means of practical demonstrations, the better methods of cultivation, such as conservation of moisture in the soil, preservation and conversion of all farm waste into manure, winter ploughing and early preparation of soil, drill sowing, inter-cultivation, etc. The scheme commenced work in April 1931 and the Committee's funds are being used for recruiting each year six itinerant demonstrators, up to a maximum of 18, for the demonstration and distribution of improved implements to the cultivator. There were during the year 18 demonstrators in charge of 57 demonstration holdings in

the four cotton districts. Eight of these holdings gave 100 per cent. and above more yield than the neighbouring cultivators' fields while 68.5 per cent. of all demonstration holdings produced 360 lbs. and over of seed cotton to the acre 'which in itself is a performance rarely obtained by the cultivator with his time-honoured methods.' The extension of the new methods of cotton cultivation is making satisfactory progress round about the centres of demonstration. During the year under report the drill-sown and inter-cultivated area extended to 19,997 acres from 2,607 acres in 1931-32 and the number of cultivators who adopted the improved methods increased to 885 from 200.

HYDERABAD.

72. *Botanical Research Scheme.*—The local cotton, *Gaorani or Bani*, though the best of the indigenous cottons from the point of spinning, is a poor ginner and is being rapidly displaced by high ginning short-staple *Neglectums*. The object of the scheme, therefore, is to study cottons which make up *Gaorani* and secure from them a prolific, high ginning and uniform type with good spinning qualities. The scheme started work in 1929. During the year under report seven pure types, viz., *Gaorani* 4, *Gaorani* 6, *Parbhani* 25, *Gaorani* 55, *Bani* 306, *Gaorani* 44 *and Gaorani* 13 were compared for yield with local mixture, *Gaorani Umri*. The first three types, which are superior to local mixture in fibre length and ginning outturn, were also found definitely superior to it in yield. In another set of varietal tests, *Havri* 3 proved a better yielder than the control, *Aurangabad Local*, but taking also other economic characters into account, *Havri* 3, *Gaorani* 9, *Parbhani* 9 and *Gaorani* 12 appear suitable as substitutes of *Aurangabad Local*. There were in addition two other sets of preliminary varietal tests of the latest selections and in each set out of the 25 selections tested five proved superior in yield to the control. A large number of pure line and hybrid progenies were also tested for various characters and the promising of them have been selected for urther tests.

73. *The Cotton Survey Scheme* was started in June 1931 for the purpose of carrying out a detailed survey of the cottons grown in the Hyderabad State as an essential preliminary for the selection of superior strains of cotton. To supplement the data collected during the past two years 167 representative samples were obtained during the year from all cotton growing parts of the State and tested at Parbhani. The results show that over 95 per cent. of the samples of the *Kharif* crop consists of three species, viz., *G. indicum*, *G. neglectum* and *G. hirsutum*. *Bani* (*G. indicum*) is predominant in Asifabad, Nizamabad, Medak, Karimnagar, Warangal, Atraf-i-Balda and Gulbarag districts. *G. neglectum* comprises of nearly three-fourths of the crop in the Raichur and Mahabubnagar districts while it does not exceed one-fourth in the Asifabad, Karimnagar, Warangal and Gulbarga districts. The proportion of this cotton in Nizamabad, Medak and Atraf-i-Balda is, however, very small. *G. hirsutum* forms 7.4 per cent. of the crop in Nizamabad district, 16 per cent. in Gulbarga district and 18.5 per cent. in Atraf-i-Balda while it

is insignificant in other districts. In *Rabi* crop, *G. hirsutum* is practically absent. *G. indicum* (*Bani*) forms the bulk of the crop in Asifabad district while *G. herbaceum* is the predominant type in the Karimnagar district and also in the northern part of the Warangal district. Practically the entire crop in Nalgonda district and in the southern part of the Warangal district is made up of *G. obtusifolium* (*Cocanadas*). These results tally with the information obtained from the survey of the standing crop in districts.

74. *Pink and Spotted Boll-worm Scheme.*—The *Pink* and *Spotted Boll-worms* in the Hyderabd State are, as revealed by the preliminary investigations carried out in 1931 and 1932 by the Cotton Research Botanist, Parbhani, responsible for an annual loss of not less than 10 per cent. of the total yield of cotton, amounting to about Rs. 45 lakhs in cash value. The Committee felt convinced of the necessity of an inquiry into these pests and sanctioned the scheme which commenced in June 1933 for ascertaining (*i*) the actual amount of damage done by them to cotton in the Godavari valley, (*ii*) the progress of their attack on the growing crop, (*iii*) the mode of their carry-over from season to season and (*iv*) the effect of the likely control measures.

The important observations of the year are summarised below :—

1. The *Spotted Boll-worm* was primarily responsible for the damage of floral buds and open flowers while the attack of the *Pink Boll-worm* was mainly confined to green bolls.

2. The damage to buds and flowers increased from 3 per cent. in August to about 25 per cent. in December and nearly 30 per cent. in March and April while the larval population of the *Pink Boll-worm* rose from 1 per cent. in September to about 40 per cent. in December and 75 per cent. in January and February. In March the population fell to about 16 per cent., in April to about half this number, and in May to practically *nil.*

3. The total loss of seed cotton for the whole season, due to the *Boll-worm* pest, was 11 per cent. of the yield. This does not include the loss due to partially affected bolls. Seed also was damaged to the extent of 10.2 per cent.

4. Hibernation takes place in soil cracks at depths varying from 4 to 18 inches and in seed. The number of moths emerged from seed was at the rate of about 27 per lb.

5. *Hibiscus esculentus, Abutilon indicum* and tree cotton provided food material to *Spotted Boll-worm* during the off-season,

Baroda.

75. *Root Rot Scheme.*—This scheme has as its object the investigation of *root rot* and the selection of suitable types of cotton resistant to this disease and it started work in February 1932. During the year under report, cultures from the affected roots of cotton gave once again the same organisms obtained the previous year, viz., *Rhizoctonia bataticola, Fusarium Vasinfectum, Nematodes* (*Cephalobus sps.*) and *Pustular fungus* (*Cephalosporium sps.*) These organisms were also found in the roots of several other crop and weed plants suffering from similar disease. Infection experiments have given clue to the parasitic nature of *Rhizoctonia bataticola. Fusarium Vasinfectum,* found in Baroda soils, seems to be a harmless form, while the same organism, when freshly introduced from Broach and Jalgaon soils gave cent. per cent. infection. On the botanical side, three of the selections appear to be a little promising, being less susceptible to *root rot* than the rest and they will be further tested during the next season.

Bikaner.

76. *The Gang Canal Scheme* started work in January 1931 at Ganganagar, in Gang Canal area, for the purpose of obtaining superior types of cotton capable of spinning up to 25s counts and also studying certain agricultural problems. The work of the past three years shows that of all cottons so far tested at Ganganagar, *Mollisoni*, a short-stapled variety, seems to be best suited to the conditions obtaining in this tract. It is a drought-resistant variety with a good ginning outturn of 39.5 per cent. Cawnpore 520 is another promising type which requires further testing. It is superior to *Mollisoni* in fibre length and appears to be nearly as hardy and good yielding as the latter. Of the foreign cottons, 289*F* looks more promising than all other varieties, though it is much inferior to *Mollisoni* in yield. May sowing has given again this year highest yield. In the case of *Mollisoni*, sowing as late as June is possible though the ginning percentage of the very late sown crop is a little adversely affected.

CHAPTER IV.

SEED DISTRIBUTION SCHEMES.

77. THE Indian Central Cotton Committee, at its meeting held in July 1929, felt convinced of the necessity of making pure seed easily available to the cultivator at a reasonable rate and adopted the policy of helping the Departments of Agriculture and Co-operative Sale Societies in wider distribution of seed of improved varieties of cotton. Sixteen seed schemes have been, since then, sanctioned. Three of them have not yet commenced for one reason or other and two were started only in April 1934.

MADRAS PRESIDENCY.

78. *Tiruppur Co.* 2 (*Cambodia*) *Seed Scheme.*—The Committee in 1929 sanctioned a small scheme for a period of five years providing the pay of an officer to act as Grader, Adviser and Business Manager to a group of co-operative societies in the Coimbatore district, which were growing the improved types of Cambodia cotton. The scheme commenced in 1931. It was amalgamated in 1933 with a new scheme, Tiruppur Co. 2 (Cambodia) Seed Scheme, sanctioned in August 1932, for the wide distribution of *Co.* 2 seed in the Salem and Coimbatore districts through the agencies of the Agricultural Department and the Tiruppur Co-operative Trading Society. The former, with the help of the Committee's grants, produces large quantities of pure seed which is sold to the latter for distribution to its members and other cultivators. The Society has been guaranteed by the Committee its actual loss on seed transactions up to a maximum of 10 per cent. of the capital invested for the purchase of seed, in addition to 5 per cent. interest on it. During the year under report the Department of Agriculture organized a seed multiplication area of over 4,000 acres, which were expected to yield 10 lakhs pounds of pure seed, enough to cover about 40,000 acres. The actual quantity of seed handled by the Society in 1934 season is not yet known.

79. *H.* 1 (*G. herbaceum*) *Seed Distribution Scheme.*—This scheme is similar to the above scheme except that no provision has been made in it for the appointment of a Business Manager to advise Co-operative Societies and that, with the help of the Agricultural Department, the societies themselves have undertaken both the multiplication and distribution of pure seed. The object of this scheme is to extend *H.* 1 cotton in the " Westerns " tract and it was started in May 1933. The Department of Agriculture supplied, during the year, the Guntakal and Hagari Co-operative Sale Societies with enough pure seed for sowing on a multiplication area of 10,000 acres and out of the seed produced from this area, about 10 lakhs pounds were stocked by the societies for distribution in the next season.

In addition the Department of Agriculture arranged, as usual, at its own cost a seed farm area of 2,895 acres for the purpose of supplying the two societies in 1934 season with enough good seed for further multiplication and distribution.

BOMBAY PRESIDENCY.

80. *Hubli Seed Extension Scheme.*—This scheme has now completed four years and unless it is extended for a further period it will come to an end next year. The Committee's subsidy is divided between the Agricultural Department and the Hubli Co-operative Sale Society for the production and distribution, respectively, of pure seed of *Jayawant*, a cross between *Dharwar No.* 1 and *Dharwar No.* 2. During the year under report the Hubli Co-operative Cotton Sale Society was able to distribute in the area served by it 12,66,320 lbs. pure seed, enough to cover about 1,31,700 acres, besides a fairly large quantity of another 3,26,455 lbs., supplied to other parts of Dharwar district and elsewhere. The Department of Agriculture arranged a reserved area of 24,000 acres and the seed obtained from it will be sufficient for 1,75,000 acres in the next season.

81. *Gadag Seed Extension Scheme.*—This scheme is very similar to the above and will also come to a close next year unless it is extended. The Gadag Co-operative Sale Society was able to distribute during the year 7,58,400 lbs. pure seed sufficient for about 75,000 acres. The Department of Agriculture had under their control a seed multiplication area of about 24,620 acres for this scheme and the quantity of seed made available to the society for distribution in the next season is not yet known.

82. *Surat Seed Extension Scheme.*—This scheme started work in April 1930. It was first sanctioned in 1929 for a period of two years and was extended for another two years in 1931 pending the final decision on the cotton policy in the Surat area. The Committee in January 1934, after full consideration of the merits of the two rival varieties of cotton, viz., 1*A Long Boll* and 1027 *A.L.F.*, decided finally in favour of the latter and extended the scheme for a further period of five years for the extension of this variety in the Surat tract. During the year, 886,771 lbs. pure seed of 1027 *A.L.F.* was distributed in Surat-Broach tract, besides a much larger quantity of 1,660,980 lbs., supplied to the adjoining States of Rajpipla, Chota Udepur and Baroda. The interesting feature of the year is that a large quantity of about 2,85,000 lbs. of 1027 *A.L.F.* seed was purchased for sowing by Sonsek, Nana Varachha, Panch Bhaya, Vedchhi, Asnad, Sandhier, Gothan, Pal and other co-operative societies which had hitherto refused to grow this variety.

83. *Khandesh Seed Extension Scheme.*—The scheme was started in December 1931 for the extension of *Banilla* cotton, a cross between *Bani* and *Comilla* cottons, in the Khandesh area. This cotton, one of the early strains of the Bombay Agricultural Department, has become so popular

of late in this area that it is spreading rapidly on its own merits, in spite of its susceptibility to wilt and deterioration in spinning quality since it was first tested. It is much superior, with all its defects, to local cotton and gives better returns. The actual area sown to this cotton, during the year, under the supervision of the Agricultural Department, was 12,900 acres. The total quantity of seed obtained from this area was 14,50,000 lbs., which would be enough for over 1 lakh acres in 1934 season.

84. *Athani Seed Extension Scheme.*—Like the Hubli Seed Distribution Scheme in the Hubli area, this scheme has as its object the multiplication and distribution of *Jayawant* seed in the Athani taluka of the Belgaum district and it commenced work in April 1932. The Department of Agriculture maintained, during the year, a reserved area of 7,156 acres, excluding the 4,000 acres that were washed off by heavy rains, and they did not expect to stock more seed than what was necessary for about 30,000 acres in the next season.

85. *Sind Cotton Extension Scheme.*—This scheme was started in April 1931 to provide the necessary staff and contingent expenditure for the introduction of cotton cultivation in new areas in Sind and for the extension of improved varieties of cotton in established cotton-growing tracts, the work to be undertaken on both banks of the Indus. The work continued, during the year, on the same lines as in previous years on both the right bank and the left bank of the river Indus. On the right bank, 27 *W.N.* (Improved Sind *Desi*) and 4 *F*-98 (American) were demonstrated in as many as 35 centres in Dadu, Larkhana and Sukkur districts and practically in every centre the latter proved the better of the two. The superiority of 4*F*-98 over 27 *W. N.* and even 289*F*-1 (American) is also evident from the results obtained from the comparative tests of these cottons, conducted on replicated plots at Dadu, Padidan, Shahdadkot and Ratodero. These demonstrations and the propaganda work have been so successful during the past 2 to 3 years that on the right bank of the river, where before the scheme was commenced, cotton cultivation was practically unknown, an area of about 1,500 acres has now been brought under cotton by *zamindars* themselves. On the left bank of the river, the work of the year consists of (*i*) comparative tests of improved cottons in localities where cotton cultivation has already been in vogue, (*ii*) introduction of cotton cultivation in non-cotton growing areas, (*iii*) trials of high quality cottons and (*iv*) multiplication and distribution of improved varieties of cotton. The results of the comparative tests of 27 *W.N.*, 4*F*-98, 285*F*-2 and 289*F*-1, carried out in 22 centres in the main cotton-growing areas, show that 27 *W.N.* and 289*F*-1 are best suited to Eastern Nara and Nawabshah districts and 289*F* and 4*F*-98 to Southern Jamrao tract ; in Hyderabad district 285*F*-2 and 285*F*-1 did better than the other two varieties. The demonstration plots in non-cotton growing areas suffered considerably for lack of water-supply and the yield obtained from them was therefore low, though by no means discouraging. As a result of these demonstrations, the area under cotton in this tract has increased from 3,000 acres in 1931-32 to 28,000 acres in 1933-34. A

seed multiplication area of 800 acres for 27 *W. N.* and 400 acres for 289*F*-1 was arranged in Nawabshah and Thar Parkar districts. The whole quantity of 289*F*-1 seed had to be rejected as it was not fit for sowing and the 4,300 maunds of 27 *W.N.* seed obtained from this area was distributed for sowing in the next season.

Central Provinces.

86. *Verum Seed Distribution and Marketing Scheme.*—This scheme was started in September 1930 and the work of the year under report consisted of propagation and distribution of pure seed of *Verum* 262 and marketing of pure *Verum* cotton. The Department of Agriculture distributed in 1933 season 2,568 *khandies* (20,13,312 lbs.) of pure *Verum* seed, enough to sow on an area of 89,560 acres and sold through Pools 5,087 bales of pure *Verum* cotton at a premium varying from Rs. 24 to 45 per *khandy* on Broach F. O. R. Bombay basis. The Department of Agriculture also stocked 3,864 *khandies* (30,29,376 lbs.) of *Verum* 262 seed and 181 *khandies* (1,41,904 lbs.) of *Late Verum*, *V.* 343 and *Bani* seed for distribution in 1934 season.

Hyderabad State.

87. *Hyderabad Seed Extension Scheme.*—It commenced in March 1930. The Department of Agriculture purchased from the Kopbal, Hubli and Gadag Co-operative Cotton Sale Societies 3,30,260 lbs. seed of *Jayawant* and *Upland* cottons and distributed the whole quantity after thorough cleaning, in 136 villages. In addition, enough seed of *Jayawant* cotton, to cover about 7,000 acres, was distributed by the Kopbal Society and some cultivators. The total area sown during the year to improved cottons in Raichur-Gulbarga area is about 24,000 acres.

Baroda State.

88. *Baroda Seed Extension Scheme.*—This scheme was sanctioned in February 1933 for a period of five years with the object of extending 1027 *A.L.F.* cotton in the Baroda State and it started work in April 1934. The Department of Agriculture distributed, during the year, 39,200 lbs. pure seed, sufficient to sow on an area of about 2,000 acres, to the members of the four cotton societies at Maroli, Umbhel, Dhundhesa and Kosamba for seed multiplication. In addition, they also started five seed depots at Maroli, Vesma, Umbhel, Baben and Kosamba which distributed to cultivators direct 2,18,400 lbs. of pure seed received from the Bombay Presidency.

RESEARCH STUDENTS.

89. Ever since its establishment over a decade ago, one of the chief concerns of the Committee has been the training of research workers in the

several sciences pertaining to cotton. Distinguished graduates from Indian Universities are selected and placed for training under experienced research workers on the Committee's schemes, at the Institute of Plant Industry, Indore, at the Committee's Technological Laboratory or under research professors in Indian Universities or are sent abroad to recognized institutions. The scholarships are usually for periods not exceeding two years but in deserving cases extensions are sanctioned.

Scholarships are awarded under two categories, viz., Training Grants and General Scholarships. Training Grants are intended for Government servants who are recommended by their Provincial Governments and for employees of the Committee who are considered to be suitable. General Scholarships are awarded to candidates selected from University Graduates, applications for which are invited by advertisement in the leading Indian newspapers.

Fifty-one research scholarships and six training grants have been given; out of these, one scholarship and four training grants were for foreign study. Ten research students were under training during the year, six being in India and four abroad.

Two training grants for foreign study were awarded during the year; no general scholarships were granted.

Expenditure on Research Studentships up to the 31st August 1934 amounted to Rs. 2,28,308-8-7.

P. H. RAMA REDDI,

Secretary.

CHAPTER V.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, 1933-34.

INTRODUCTION.

THE present report gives an account of the work done at the Technological Laboratory during the year ending 31st August 1934. It will be seen from a perusal of the report that as in the past the work of the Laboratory has continued to grow in all directions and the Provincial Agricultural Departments, the trade and the industry have taken full advantage of the facilities provided by it for carrying out tests on samples of cotton. During the period under review the total number of samples on which spinning tests were performed rose to the high figure of 548, which establishes a new record and represents an increase of nearly 20 per cent. over last year's figure. It may be mentioned in passing as an instance of the increase in the work of the Laboratory that this number is nearly three times of that for 1928-29, and more than double of that for 1929-30. Thus in so far as the spinning tests *alone* are concerned, the work of the Laboratory has doubled since 1929-30. In spite of the heavy rush of samples which were subjected to spinning tests, satisfactory progress was made in the technological and research activities of the Laboratory.

The work done during the period under review will now be described under the following five heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the samples tested during the period under review together with the names of the officers who supplied them :—

BOMBAY.

(1) *The Cotton Breeder, S.M.C., Dharwar.*—16 samples of Dharwar, Jayawant, Gadag and strains.

(2) *The Cotton Breeder, Jalgaon.*—20 samples of Banilla grown in Districts, N. R. and Local.

(3) *The Superintendent, Padegaon Farm.*—5 samples of N. R. and Banilla cotton.

(4) *Deputy Director of Agriculture, Surat.*—30 samples of 1027 A.L.F. and Selection 1A from district trial plots.

(5) *The Cotton Breeder, Surat.*—1 sample of Surat 5[1] and 4 samples of Selections.

(6) *The Cotton Breeder, Broach.*—4 samples of Selections and Broach-*Desi* 8.

(7) *The Cotton Breeder, Viramgam.*—17 samples of Selections.

(8) *The Cotton Physiologist, Agricultural Research Station, Sakrand.*—4 samples of watering experiments.

(9) *The Cotton Assistant, Government Seed Farm, Mirpurkhas.*—3 samples of strains.

(10) *The Botanist in Sind, Sakrand.*—7 samples of Boss-III, Sea Island, Ashmouni, 289F, etc.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—8 samples for effect of ginning tests, 7 samples of irrigation experiments, 27 samples of *Desi* Varietal tests, propagation tests, effect of climate on lint, and sowing tests.

UNITED PROVINCES.

(1) *Economic Botanist to Government, Cawnpore.*—6 samples of C402 and C520 cottons.

CENTRAL PROVINCES.

(1) *The Economic Botanist for Cotton, Nagpur.*—7 samples of Bani, Buri and Verum cottons.

(2) *The Superintendent, Agricultural Farm, Akola.*—2 samples of Verum cotton.

MADRAS.

(1) *The Farm Manager, Hagari.*—2 samples of Hagari (manurial experiments) and 8 samples for comparative trial experiments.

(2) *The Cotton Specialist, Coimbatore.*—11 samples for manurial experiments, 10 samples for spacing experiments, 12 samples for irrigation experiments.

(3) *The Superintendent, Agricultural Research Station, Koilpatti.*—8 samples of strains and Uppam, 17 samples for manurial, no manure and other experiments.

(4) *The Farm Manager, Nandyal.*—9 samples of strains, 11 samples of Selections and Gadag cotton.

(5) *The Superintendent, Dry Farming Research, Bellary.*—8 samples of Selections.

(6) *The Cotton Assistant, Guntur.*—5 samples of strains including control sample.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—15 samples of different strains; 5 samples of Mollisoni.

(2) *The Agricultural Inspector, Devangere.*—3 samples of Selection 69.

(3) *The Agricultural Inspector, Chitaldurg.*—5 samples of Selection 69 and Local cottons.

(4) *The Assistant Botanist, Government Experimental Farm, Hiriyur.*—One sample of Herbaceum, 12 samples of Selections and strains.

(5) *The Cotton Research Botanist, Parbhani.*—4 samples of Hyderabad-American selections; 17 samples of Gaorani, Parbhani and Bani cottons; 1 sample of Parbhani-American.

(6) *The Inspector, Cotton Seed Distribution, Kopbal.*—3 samples of Selections.

(7) *Ag. Cotton Breeder, Baroda State, Baroda.*—2 samples of Broach selections.

(8) *Officer-in-charge, Cotton Root Rot Scheme, Baroda.*—4 samples of Broach—9 (different pickings) cotton.

(9) *The Crop Botanist, Malwa Division, Ujjain.*—13 samples of Malvi and other strains.

(10) *Deputy Director of Agriculture, Meiktila, Upper Burma.*—4 samples of Selections.

(11) *The Agricultural Officer, Bukalasa Experiment Station, Uganda.*—8 samples of Uganda cotton.

It was stated in my last annual report that the Indian States were paying greater attention to the condition of the cotton crop in their territories. It is gratifying to note that the desire on the part of the States to improve the quality of their cotton crop has continued unabated, as shown by the fact that during the period under review no less than 85 samples were received for tests from the States. Most of these were sent through the Institute of Plant Industry, Indore, and represented the new strains which are being tried in the States of Central India and Rajputana. It was also mentioned in my last year's report that the Department of Agriculture, Uganda Protectorate, approached the Indian Central Cotton Committee with the request that tests may be made at the Technological Laboratory on their new selections. In accordance with the decision of the Indian Central Cotton Committee these tests were carried out and a report was sent in due course to the Director of Agriculture, Uganda Protectorate. This report was highly appreciated by the Department referred to above, who repeated the request for further tests on their selections. The Indian Central Cotton Committee again decided that these tests may be performed at the Technological Laboratory and accordingly eight samples from the Director of Agriculture, Uganda Protectorate, were received and tested. I may also mention that the Department of Agriculture, Burma, who had not sent any sample of their new varieties during the last few years decided to take advantage of the testing facilities offered by the Laboratory and sent four samples which were tested and reported upon.

It will be seen from the statement of cotton samples given on pages 45-48 that during the year under review the resources of the Spinning Laboratory were strained to the utmost in coping with the large number of samples received for tests. The Fine Roving Frame, which was installed last year, proved extremely helpful in providing a bye-pass for the finer counts at a stage where in the past samples were held up, but, apart from this mechanical aid, the writer must express his appreciation of the work of the staff of the Laboratory, especially those in the Spinning Section, who discharged their duties with commendable industry and diligence. The manner in which the number of samples tested at the Laboratory has continued to increase from year to year is shown by the following three Tables which give the distribution of samples, lots and yarns spun since 1924-25.

TABLE I.—*Distribution of Samples Spun*, 1924-34.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	Totals, 1924–34.
Bombay	18	26	22	22	28	66	89	69	143	111	594
Punjab	14	1	..	..	42	30	10	44	55	42	238
United Provinces ..	7	..	6	11	9	7	16	7	12	6	81
Madras	2	19	50	23	30	51	66	15	28	101	385
Central Provinces ..	2	..	3	2	2	5	3	3	5	9	34
Miscellaneous	3	11	..	6	6	27	28	33	75	97	286
Total ..	46	57	81	64	117	186	212	171	318	366	1,618
Standard Cotton Tests.	8	54	49	64	33	34	27	18	18	16	321
Trade Tests and Special Tests ..	..	..	..	..	..	37	89	134	125	166	551
Total Tests ..	54	111	130	128	150	257	328	323	461	548	2,490

TABLE II.—*Distribution of Lots Spun*, 1924-34.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	Totals, 1924–34
Bombay	36	52	44	44	53	107	90	69	143	111	749
Punjab	26	4	..	..	83	41	10	44	55	42	305
United Provinces ..	14	..	12	22	18	14	16	7	12	6	121
Madras	4	38	100	46	60	85	66	16	28	101	544
Central Provinces ..	3	..	6	4	4	10	4	3	5	9	48
Miscellaneous	3	22	..	12	9	33	29	33	75	97	313
Total ..	86	116	162	128	227	290	215	172	318	366	2,080
Standard Cotton Tests.	34	176	142	178	68	64	54	36	36	32	820
Trade and Special Tests	..	..	..	..	..	37	119	186	129	175	646
Total Tests ..	120	292	304	306	295	391	388	394	483	573	3,546

TABLE III.—*Distribution of Yarns Spun*, 1924-34.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	Totals, 1924–34
Bombay	103	152	132	132	159	322	253	203	430	332	2,218
Punjab	106	14	..	..	254	113	31	136	165	127	946
United Provinces ..	27	..	36	66	54	42	40	22	32	18	337
Madras	12	108	278	138	180	255	199	53	85	303	1,611
Central Provinces ..	8	..	18	12	12	30	12	9	15	27	143
Miscellaneous	3	58	..	36	27	99	100	93	227	293	936
Total ..	259	332	464	384	686	861	635	516	954	1,100	6,191
Standard Cotton Tests.	95	514	423	447	290	223	309	136	209	180	2,817
Trade and Special Tests	..	..	..	..	..	80	343	502	256	499	1,680
Total Tests ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	10,688

It will be seen from Tables I and II above that the number of samples and lots spun during the period under review shows an increase of nearly 20 per cent. over the corresponding figure for last year, while the number of yarns spun during the same period shows an increase of 26 per cent. The statement given on pages 45-48 of this report does not include either those small-sized samples on which fibre tests alone were performed or those on which yarn tests were made. A summary of the former is given on pages 59-60 of this report while the latter were tested for mills on payment of certain fees laid down by the Indian Central Cotton Committee.

The results of the tests performed at the Laboratory are embodied in spinning test, fibre test or yarn test reports which are either issued to the officers or mills supplying the samples or, in the case of commercial varieties, published as technological circulars. The following Table gives a summary of the various types of reports which were issued during the period under review.

TABLE IV.—*Test Reports issued*, 1924-34.

	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	1932–33	1933–34
Spinning Test Reports	7	19	19	22	21	63	92	60	87	12
Fibre Test Reports	1	1	5	1	7	4	7	19	30	18
Yarn Test Reports	..	..	..	1	4	4	2	3	5	3
Total Reports ..	8	20	24	24	32	71	101	82	122	142

The number of spinning test reports increased from 87 in the last year to 121 in the present year, showing an increase of nearly 40 per cent. On the other hand the number of fibre test reports diminished from 30 to 18. As mentioned on page 59 of this report the number of samples for fibre tests was actually about the same as in the last year, but on account of the large increase in the number of samples received for spinning tests which are ordinarily given preference, comparatively few small size samples could be tested and hence fewer fibre test reports were issued than last year. The total number of reports, of all descriptions, issued during the period under review is 142 as against 122 for last year, showing an increase of 16 per cent.

In view of the yearly increase in the number of samples received for tests the work of the Fibre Testing Section and the Yarn Testing Section was reorganized whereby an increase in their output of 20 to 30 per cent. was secured with the addition of only one Junior Tester. Without this re-organization of work a proportionate increase in the number of Junior Testers would have been inevitable. The strength of the permanent staff at the Laboratory from year to year since 1924 will be seen from the following Table.

As at August 31st in	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Technical staff ..	8	11	20	24	27	27	32	32	32	33	34
Research Students ..	1	3	6	4	3	2	1	1	..	..	..
Fumigation Chemists .	..	..	2	4	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36

The bulk of the testing work falls upon the Junior Testers who are kept fully occupied with the determination of the various fibre properties and the yarn characteristics required to assess the spinning quality of a cotton. In the case of most cottons tested at the Laboratory the mean fibre-length and the fibre-weight per inch of each sample are determined, and the yarns spun are examined for lea-breaking strength, single thread strength, extension, actual count, actual twist, yarn neppiness and yarn evenness. In addition to this, various secondary statistics such as irregularity percentages of strength and extension and weakness percentage are calculated and given in the spinning test reports. An idea of the amount of work involved in these tests may be had from the fact that, during the period under review, the number of yarn tests alone carried out at the Technological Laboratory amounted to nearly a million.

Classification of Samples.

It will be seen from Tables I—III that the samples tested at the Laboratory fall under the following four main heads :—

(*a*) Agricultural samples.
(*b*) Standard cottons.
(*c*) Trade samples.
(*d*) Technological samples.

(*a*) *Agricultural samples.*—These samples are received from Cotton Breeders or other officers of the Provincial Agricultural Departments who are charged with the work of improving the quality of cotton in their respective areas. These represent either new selections or samples grown in connection with physiological, botanical or agronomical research schemes of the Committee. They form by far the greater proportion of the samples tested at the Laboratory, and during the year under review 67 per cent. of samples were received from the Agricultural Departments. Among these the following are worthy of special reference.

(1) *Irrigation experiments.*—The object of these experiments is to find out the water requirements of the cotton crop which should give optimum results as regards yield and spinning quality of cotton. A beginning was made in this direction two years ago by performing tests on samples of 4F cotton grown by the Cotton Research Botanist, Lyallpur. As these tests gave some very interesting results it was decided to ask other Cotton Breeders

to co-operate in this investigation by sending samples of cotton which differed only in the amount of water applied to the crop during the growing period. Accordingly, for the last two years samples have been received from Bikaner, Sakrand, Coimbatore and Lyallpur, and a summary of the tentative results obtained so far is given below :—

Bikaner.—Frequent and heavy irrigation resulted in better yield, higher ginning percentage, and stronger yarns, but the differences between the various samples as regards these characteristics are not large.

Sakrand.—Regular irrigations gave slightly longer fibres. Ten irrigations as compared with seven gave less immature fibres, smaller waste losses in processing the cotton and stronger yarns with fewer yarn breakages in the ring frame.

Coimbatore.—The effect of different spacings and irrigations were considered conjointly. Compared with the dry sample, irrigation resulted in higher yield of seed cotton, smaller number of immature hairs and fewer neps in yarns, but it did not produce any change either in fibre-length or fibre-weight per inch.

Lyallpur.—In the case of frequently irrigated sample, the mean fibre-length showed an improvement as the number of irrigations was increased, especially when irrigation was applied judiciously at the right time. Both the fibre-weight per inch and the percentage of mature hairs showed a tendency to increase with the number of irrigations. The waste losses, number of yarn breakages in the ring frame, yarn evenness and yarn neppiness did not show any significant variation nor was the spinning performance of P.A. 4F affected to any appreciable extent by the different amounts of water applied to the crop.

(2) *Manurial experiments.*—The object of these experiments is to ascertain the effect of different manures on the yield and quality of cotton. This year six samples were received from Sakrand and subjected to the usual tests. A paper containing the results of tests on the samples received in 1928-29 and 1929-30 from Coimbatore was read before the Indian Science Congress at its session held in Bombay. When sufficient material is available, the results of this investigation will be published in the form of a Technological Bulletin.

(3) 1027 *A.L.F. and Selection* 1*A.*—Last year eighty samples of these two cottons were received from Surat and Baroda, 40 belonging to 1027 A.L.F. and the other 40 to Selection 1A. Fibre tests and spinning tests were made on these samples and a report was submitted to the special Sub-Committee of the Indian Central Cotton Committee appointed to recommend on the policy of the Committee in respect to the cultivation of cotton in Gujarat. The Committee, after taking into consideration the results of field observations and the Laboratory tests, decided in favour of 1027 A.L.F.

(4) *Rotation experiments.*—The object of these experiments is to find out the effects on the quality of cotton grown after various such crops as cumbu, cholam, groundnut, etc. Last year six samples of Cambodia Co. 2 were tested at the Laboratory. It was found that, taking both yield and spinning performance into consideration, the sample grown after green manure gave the best results, while those after groundnut and fallow gave better results than those grown after cumbu, cholam, or ragi. Another set of six samples, grown with similar treatments, was received this year from the same officer and a report on it will be issued in due course.

(5) *African cottons.*—Fibre tests on A. R. Kampala, A. R. Busoga and A. R. Jinja have been in progress in the Laboratory for some time past at the request of the East India Cotton Association with a view to helping the Association to lay down suitable standards of length for these types. The results available up-to-date were forwarded to the East India Cotton Association and were considered by their Special Appeal Committee on 22nd March 1934. The Sub-Committee recommended that tests on these cottons should be continued for another season with this modification, that the Millowners' Association should be asked to select three or four samples of fair average quality of these cottons from which the Appeal Committee of the East India Cotton Association should select samples to be tested at the Laboratory. During the period under review 15 samples of these cottons were received and tested.

Banilla cotton.—Tests on samples of Banilla and N.R. cottons collected from the cultivators' fields in Khandesh are being continued with a view to ascertaining any change in the quality of these cottons when grown in the cultivators' fields. These tests are in continuation of the tests on this cotton which formed the subject of the Technological Bulletin, series A, No. 22.

(*b*) *Standard cottons.*—These cottons represent improved varieties of cotton which are grown in different parts of India. Some of these cottons were evolved by the Provincial Agricultural Departments ; others, such as Verum 262 and Jayawant, were developed by the departments in collaboration with the Indian Central Cotton Committee. For the last ten years these cottons have been subjected to a very thorough examination for their fibre properties and spinning value and the results of these tests have been published each year in the form of a Technological Bulletin. Since last year the measurement of such fibre properties as rigidity, convolutions, and ribbon width which were found to give very little extra information as regards the spinning performance of the cotton has been discontinued. This year a new fibre property, viz., the percentage of mature hairs in cotton, has been included and the results of maturity tests have been included in the Bulletin for the first time. Two cottons, C.A.9 and Hagari 25, have been deleted from the list of Standard cottons as the former has almost completely gone out of cultivation and the latter has been replaced by Hagari 1. As most of these cottons are now grown on a commercial scale and are available in the market, the results of fibre tests and spinning tests are published in the form of 4-page

circulars soon after their arrival in the market. During the year under review 4-page circulars were published on the following ten cottons :—

(1) Cambodia Co. 2.
(2) Hagari 1.
(3) Jayawant (Kumpta).
(4) Gadag 1 (Dharwar-American).
(5) 1027 A.L.F.
(6) Punjab-American 4F.
(7) Punjab-American 289F.
(8) Verum 262 (Nagpur).
(9) Verum 262 (Akola).
(10) Umri Bani.

One of the objects of the very thorough tests on these cottons was to find out a statistical formula for the prediction of spinning value of a cotton from its fibre properties. During the year under review a bulletin dealing with the results of tests on 95 cottons was published by Dr. A. J. Turner and Mr. V. Venkataraman, a summary of which is given on page 64 under " Publications."

(c) *Trade samples.*—These samples have been tested at the Laboratory for the last five years in accordance with the arrangements entered into between the Indian Central Cotton Committee on the one hand and the East India Cotton Association, Bombay, the Millowners' Association, Bombay, and the Millowners' Association, Ahmedabad, on the other. The object of these tests is to provide the trade and the industry with reliable information as regards waste losses and spinning value of either the main representative types of commercial Indian cottons (the East India Cotton Association samples) or the first arrivals of the new crop of a season (Bombay and Ahmedabad Millowners' Association samples). Tests on these samples are performed immediately on their arrival at the Laboratory and the results are published in the form of 2 or 3-page circulars within the shortest possible space of time. The following statement gives a description of trade samples received for tests:—

Cottons supplied by the East India Cotton Association.

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Nanded.
5. Lattur.
6. Muttia.
7. Punjab-American.
8. Broach.
9. Jagadia Farm.
10. Surat.
11. Navsari.
12. Dholleras (Wagadia).
13. Kalagin.
14. Kadi-Viramgam.
15. Westerns (Jhaveria).
16. Farm Westerns.
17. Coompta.
18. Upland (Gadag).
19. Bijapore.
20. Bagalkote.
21. Cambodias.
22. Tinnevelly.
23. Karungannis.
24. A. R. Kampala.
25. A. R. Busoga.
26. A. R. Jinja.

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

BOMBAY.

1. Kosi (Bengal).
2. Saudha (Khandesh).
3. Ujjain (Central India).
4. Padtur (Moglai).
5. Mandusar (Ujjain).
6. Hubli Coompta.
7. Hubli Upland.
8. Surat.
9. Cambodia.
10. Guntakal (Westerns).
11. Shedbal (Miraj).
12. Farm Westerns.
13. Broach (Sadhli).
14. Bailhongal.
15. Tirupur Cambodia.
16. Karunganni.

AHMEDABAD.

1. Jagadia. 2. Kadi. 3. Bawla.

A list of technological circulars issued on these samples will be found under " Publications." Commencing with last year these circulars contained not only the results of tests on the current season's samples but also those of the previous seasons' tests so as to enable the trade and the industry to judge for themselves whether any deterioration or improvement was noticeable in any of the types which was subjected to tests at the Laboratory in the successive seasons. These circulars on trade samples are freely quoted in the English and Continental textile journals and thereby provide the necessary information as regards the waste losses and the performance of the representative types of Indian cottons to consumers abroad.

In addition to tests on trade samples a number of investigations are in progress at the Laboratory which are of special interest to the trade. These will now be briefly described.

(1) *Deterioration of Broach cotton with lapse of time.*—The opinion is held by a large section of the trade that Broach cotton deteriorates rather more rapidly and to a greater extent than other types. The Moisture Sub-Committee of the East India Cotton Association considered this point and recommended that tests should be made at the Technological Laboratory with a view to ascertaining the extent of deterioration in grade and strength suffered by Broach cotton with lapse of time. Accordingly a bale of Broach cotton (Palej) was purchased for the purposes of this investigation, a sample, weighing about 24 lbs., was drawn from the top of the bale and subjected to fibre and spinning tests. The bale was re-pressed by hand and stored in the samples room of the Laboratory. After six months, two more samples, one from the top and the other from the middle of the bale, were drawn and tested. The bale has again been re-pressed by hand and after another six months two more samples, one from the middle and the other from the bottom of the bale, will be drawn and tested. In addition to the usual fibre

tests, the fibres have been examined for any possible injury due to mechanical damage or fungoid growth. The object of drawing samples from different parts of the bale is to allow for the effect on the quality and grade of cotton of opening the bale and re-pressing it by hand. This investigation is in progress and will be completed next year.

(2) *Effect of different degrees of compression in a bale.*—At the suggestion of the writer the Committee at its meeting held in January 1934 decided that an investigation should be undertaken on the effect of pressing the bale with different degrees of compression. Accordingly three bales each of Berar and P. A. 289F cottons weighing approximately 400 lbs., 300 lbs., 200 lbs., but pressed to the normal size were obtained together with samples of loose cotton from which the bales had been prepared. Fibre and spinning tests were made on samples of loose cotton immediately on their receipt at the Laboratory, but the bales were stored for about four months. These were opened and representative samples weighing 24 lbs. were drawn, spun in duplicate lots and tested. Besides the usual Laboratory tests the yarns obtained have been sent to an expert grader for valuation and report as regards their class, evenness and neppiness. A report embodying the results of these tests will be submitted to the Indian Central Cotton Committee at its next meeting.

(3) *Effect on the quality of lint due to storage of kapas before ginning.* —The impression is held in some quarters that storage of *kapas* for a few weeks prior to ginning improves the lustre and quality of the fibre. This improvement is said to be due to the diffusion of oil from the seed into the fibres. To test this view which, if correct, is likely to benefit the cultivator, the Cotton Research Botanist, Lyallpur, was asked to co-operate in the investigation by supplying samples of 4F, 289F and Mollisoni which were obtained from *kapas* ginned immediately after picking and ginned after a storage of four weeks. Besides the usual fibre tests the wax content of the fibres was also determined. These tests have been completed and their results will be shortly published in the form of a Technological Bulletin.

(4) *Deterioration of cotton stacked in open plinths at Karachi.*—This investigation was undertaken nearly two years ago with a view to finding out the extent of deterioration in grade and quality of cotton which is stacked in open plinths at Karachi. For the purposes of this investigation 18 bales of the chief representative types which are received in bulk in the Karachi market were purchased, half of these were stored in a covered godown while the other half were stacked in the open thole yard. Samples have been drawn at intervals of approximately six months from the bales stored in the godown and the corresponding bales stored in the thole yard and tested at the Laboratory. Besides the usual tests at the Laboratory these samples were also sent to the Karachi Cotton Association, Karachi, and to the East India Cotton Association, Bombay, for valuation and report on their grade and quality by their Appeal Committees. Hitherto tests have been completed on 12 out of the 18 bales. The investigation will be finished next

year when a report containing the results will be submitted to the Indian Central Cotton Committee. In connection with this investigation my best thanks are due to Messrs. Volkart Bros. for their kindness in affording full facilities for storing the bales and to the Karachi Cotton Association and the East India Cotton Association for their courtesy in valuing the samples from time to time.

(5) *Tests on damped and dry cotton.*—As stated in my last annual report, these tests were undertaken with a view to ascertaining the influence on the quality of lint of pre-humidifying bales with known amounts of water. For the purposes of this investigation Messrs. Volkart Bros., Bombay, very kindly placed three bales of Amraoti cotton which had been pre-humidified to different degrees at the disposal of the Technological Laboratory. Samples have been drawn at regular intervals from these bales and tested for fibre properties and spinning value. This investigation is in progress.

(6) *Effect of pre-humidification before pressing on Broach cotton.*—Arising out of the above investigation similar experiment was undertaken on Broach cotton at the suggestion of the Moisture Tests Sub-Committee of the East India Cotton Association. The East India Cotton Association very kindly supplied four bales of Broach cotton for this purpose from which samples have been drawn at regular intervals and subjected to usual fibre and spinning tests. This investigation is also in progress.

The Technological Laboratory has, as usual, continued to afford assistance, when required and when such assistance did not interfere with the normal work of the Laboratory, to the industry in the solution of its specific problems. During the period under review 14 samples for fibre tests, 14 samples for spinning tests, 18 samples for yarn tests and 4 samples for wax content determination were submitted by the mills. These tests are undertaken on payment of certain fees laid down by the Indian Central Cotton Committee and the scale of fees, which was modified and extended to cover the various tests which the Laboratory is called upon to undertake from time to time, stands at present as follows :—

SCALE OF FEES.

(1) *Fibre or Yarn Test :*

		Rs.	a.	p.
(*a*)	Mean fibre-length	7	8	0
(*b*)	Fibre-weight per inch	7	8	0
(*c*)	Fibre-strength	10	0	0
(*d*)	Maturity	7	8	0
(*e*)	Lea test	7	8	0
(*f*)	Ballistic test	7	8	0
(*g*)	Single thread test	7	8	0
(*h*)	Twist	7	8	0

		Rs.	a.	p.
(2)	*Fibre and Blow-room Test :*			
	(*a*) Fibre tests—As for (*a*)—(*d*) above			
	(*b*) Blow-room only	10	0	0
(3)	*Full Test :*			
	(*a*) Fibre tests—As for (*a*)—(*d*) above.			
	(*b*) Spinning tests only	35	0	0
	(*c*) ,, ,, on combed cotton	50	0	0
(1)	Variety of cotton (broad classification)	25	0	0
(2)	Identification of fibres (microscopic test)	15	0	0
(3)	Percentage of size	7	8	0
(4)	,, of grease	7	8	0
(5)	,, of free acid	15	0	0
(6)	Presence of mildew	7	8	0
(7)	Causes of mildew growth	30	0	0
(8)	*Percentage of immature fibres.*—			
	(*a*) In lint or *kapas*	10	0	0
	(*b*) In yarn or cloth	15	0	0

(*d*) *Technological samples—Ginning tests.*—As stated in my last annual report this investigation was undertaken with a view to determine the relationship between the ginning conditions of a cotton and the quality and degree of neppiness of yarns spun from it. For the purposes of this investigation samples of *kapas* of eight Indian cottons representing a fairly wide range of fibre properties were procured and were ginned in the roller gin and the saw gin of the Laboratory. The spinning tests on these samples have now been completed but some of the fibre tests yet remain to be done. As soon as the fibre tests are also completed and the results have been analysed, these will be published in the form of a Technological Bulletin.

Balanced and unbalanced drafts.—This investigation has been in progress at the Laboratory for the last year and a half with the object of finding out the influence of different drafts on mixings made from Indian cottons. Further progress has been made in the spinning of samples in connection with this investigation.

II. RESEARCH LABORATORY.

Fibre Testing Section.—This section is entrusted with the work of carrying out fibre tests on all the agricultural samples on which spinning tests are made at the Laboratory. In addition, it takes fibre tests on such small size samples which are as yet in the preliminary state of experimentation and on which spinning tests are either not required or not possible. It furthermore undertakes examination of fibre properties of the Standard cottons and also of the fibre properties of such samples as are processed in connection with the various investigations in progress at the Laboratory. Normally, in the case of agricultural samples, the mean fibre-length and the fibre-weight per inch are determined while in the case of Standard cottons the fibre-strength is also measured. In the case of some special samples additional fibre properties such as convolutions or ribbon width may also be determined if it is anticipated that the determination of such properties will help in the elucidation of the results. As a result the staff employed in this section has been fully occupied with the determination of the fibre properties of numerous samples sent for examination to this section. During the period under review 110 small sized samples were received for fibre tests, the Institute of Plant Industry, Indore, alone contributing 71 samples. In view of the large increase in the number of large size samples on which fibre tests had also to be performed, it was not possible to make fibre tests alone on more than 44 samples. The following statement gives an account of the small size samples which were subjected to fibre tests, together with the names of the officers or mills supplying them :—

(1) *The Cotton Breeder, South Gujarat, Surat.*—4 samples of Selections.

(2) *The Cotton Superintendent, S.M.C., Dharwar.*—2 samples of Moglai cotton.

(3) *The Cotton Breeder, Khandesh, Jalgaon.*—3 samples of Selections.

(4) *The Superintendent, Arbhavi Farm, Arbhavi (Belgaum).*—1 sample of Bagalkote cotton.

(5) *The Geneticist and Botanist, Institute of Plant Industry, Indore.*—6 samples of Nimrani and Malvi cotton.

(6) *The Technical Adviser, Kutch State, Bhuj.*—1 sample of Kutch cotton.

(7) *Director of Agriculture, Bhopal State, Bhopal.*—3 samples of strains.

(8) *Mr. R. Dokras, Chandur.*—1 sample of Dokras II.

(9) *Messrs. Damodar Thackersey Mooljee & Co.*,—1 sample of Busoga cotton.

(10) *Agents, New Kaiser-I-Hind Spg. and Wvg. Mills Ltd.*—2 samples of Kampala and Bukadi cottons.

(11) *R. G. Saraiya, Esq., Bombay.*—1 sample of A. R. Mwanza cotton.

(12) *Messrs. E. D. Sassoon & Co., Ltd., Bombay.*—One sample of White cotton and 2 samples from cotton bowl.

(13) *Volkart Bros., Karachi.*—1 sample of Sind-American 289F.

(14) *The East India Cotton Association, Ltd., Bombay.*—5 samples of each of A. R. Kampala, A. R. Busoga and A. R. Jinja cottons (African cottons).

Mr. Hari Rao continued to supervise the work of this section and, in addition, made satisfactory progress in his investigation on the effect of twist on the strength of fibres of Indian cottons.

Physics Section.—Mr. Koshal completed his paper on the Effect of Rainfall and Temperature on Percolation through Drain Gauges, on which he had worked during his stay at Rothamstead. This paper has been published in the *Journal of Agricultural Science,* Cambridge, and a summary of it is given under "Publications." Mr. Koshal has also made further progress with his investigation on the Characteristics of Fluorescent Light emitted by different cottons when irradiated by Ultra-Violet Rays. In addition to this, he undertook the analysis of the results available for the Standard Indian Cottons for the last ten years with a view to ascertaining the influence of weather and soil conditions on the quality of lint. This work is in progress. At the suggestion of the writer, Mr. Koshal also wrote a paper on the Layout of Field Experiments which was read before the Indian Science Congress at its session held in Bombay last year. A summary of this paper will be found under "Publications."

Mr. Nanjundayya made further tests with the new stapling apparatus with a view to collecting more data which should enable one to compare the results obtained by this method with those obtained with the older methods. A paper containing a short preliminary account of this method prepared by Mr. Nanjundayya and the writer was read before the Indian Science Congress at its session held in Bombay last year. A summary of it will be found

under " Publications." Mr. Nanjundayya also completed his paper on the relationship between strength and length of cotton fibre which will be sent up for publication in due course.

Mr. Kapadia completed the experimental part of his investigation on carding problems in collaboration with Mr. R. P. Richardson and was engaged part of the time in the analysis of the results obtained from the experimental data. Before, however, the results of this investigation could be finally written up for publication, Mr. Kapadia received an offer of appointment elsewhere and was permitted to leave the service of the Committee on 1st July 1934.

Dr. R. N. Mathur completed his investigation on the relationship between ribbon width as determined by an improved method and the other properties of cotton fibre, and on the completion of his temporaryperiod of appointment left the service of the Committee on 16th May 1934.

Chemistry Section.—As in the past, Mr. D. L. Sen continued to perform moisture tests on samples of cotton drawn from commercial bales of trade varieties. An account of this work will be found under the head " Moisture Testing Section." He also completed the analysis of the results of the investigation into the relationship between the wax content and the feel of cotton. An account of this investigation has been published in a Technological Bulletin, a summary of which will be found under " Publications." He furthermore completed the chemical analysis of lint obtained from Coimbatore samples which had received different manurial treatments. A paper embodying the preliminary results of this investigation, prepared by Mr. Sen and the writer, was read before the Indian Science Congress at its session held in Bombay last year. A summary of this paper will be found under " Publications."

Microscopy Section.—Mr. Gulati made good progress in analysing and writing up the results obtained in connection with his investigation on the percentage of mature hairs in different Indian cottons and the relationship between maturity and fibre-strength. An account of this investigation will be published in due course in the form of a Technological Bulletin. He also made numerous tests of the maturity percentage of all Standard cottons as well as many agricultural samples which were asked for by the Cotton Breeders, who require this information for their hybridisation experiments. Mr. Gulati has also assisted me greatly in the investigations on the deterioration of Broach cotton and the effect of different degrees of compression in a bale to which references have been made above, by undertaking the examination of the damage done to fibres by fungoid growth or mechanical injury.

III. MOISTURE TESTING SECTION.

The work of this section is now mainly confined to testing of samples drawn from trade bales as they are received in Bombay with a view to

ascertaining the average moisture content of the main types of Indian cottons. During the period under review the number of samples of cotton tested for their moisture content was 145 as against 111 of last year, showing an increase of nearly 31 per cent. This includes 5 samples received from the Appeal Committee of the East India Cotton Association and 12 samples drawn from the bales stored at the Cotton Exchange, Sewree, in connection with the Effect of Pre-humidification on the Quality of Lint, to which a reference has been made above. The total number of samples tested in this section from its inception amounts to 721. The writer prepared a report embodying the results of tests carried out up to 30th June 1933 which was considered by the Moisture Tests Sub-Committee of the East India Cotton Association at its meeting held on 20th March 1934. The Sub-Committee recommended that tests should be continued in the current season particularly on U.P., Sind, Kathiawar, Surat, Navsari, Moglai and Madras as well as the African cottons which are received in the Bombay market.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins and Circulars issued during the period under review :—

I. Technological Bulletin Series A, No. 25.

(1) Series A, No. 25, September 1933, Testing of Indian Cottons for Quality at the Technological Laboratory, by Nazir Ahmad, M.Sc., Ph.D.

II. Technological Bulletins, Series B, Nos. 17 and 18.

(1) Series B, No. 17, June 1933, The Foundations of Yarn-Strength and Yarn-Extension, Part V, The Prediction of the Spinning Value of a Cotton from its Fibre-properties, by A. J. Turner, M.A., D.Sc., and V. Venkataraman, M.A.

(2) Series B, No. 18, December 1933, A Note on the Wax Content of Indian Cottons with Special Reference to their Feel, by N. Ahmad, M.Sc., Ph.D. and D. L. Sen, M.Sc., Tech., A.I.C.

III. Papers read before the Indian Science Congress held in Bombay in January 1934 :—

(1) Application of modern methods of field experiments for improving the yield and quality of agricultural produce.

(2) New Method for the determination of the mean fibre-length and the fibre-weight per inch of cotton.

(3) Effect of manure on the yield, fibre properties and spinning quality of cotton.

IV. Technological Circulars, Nos. 104 to 149, as under :—

Circular No.	Cottons.	Date of publication.
104	Tinnevelly and Karunganni cottons, 1932-33	September 1933.
105	Westerns and Farm Westerns, 1932-33	September 1933.
106	Kumpta and Upland, 1932-33	September 1933.
107	Punjab-American and Cambodia, 1932-33	September 1933.
108	Bijapur and Bagalkote, 1932-33	September 1933.
109	A. R. Kampala, A. R. Busoga and A. R. Jinja, 1932-33	December 1933
110	Umri Bani, 1933-34	January 1934.
111	Verum 262 (Akola) 1933-34	January 1934.
112	Khandesh and Bengals, 1933-34	February 1934.
113	Ujjain, 1933-34	February 1934.
114	Punjab-American 289F, 1933-34	February 1934.
115	Verum 262 (Nagpur), 1933-34	February 1934.
116	C. P. No. 1 and Berar, 1933-34	February 1934.
117	Khandesh, 1933-34	February 1934.
118	Ujjain (Mandusar), 1933-34	February 1934.
119	Moglai, 1933-34	February 1934.
120	Punjab-American, 4F, 1933-34	March 1934.
121	Muttia, 1933-34	March 1934.
122	Lattur and Nanded, 1933-34	March 1934.
123	Hubli Kumpta and Hubli Upland, 1933-34	April 1934.
124	Broach and Surat, 1933-34	April 1934.
125	Punjab-American 1933-34,	April 1934.
126	Westerns and Miraj, 1933-34	May 1934.
127	Surat 1027 A.L.F., 1933-34	May 1934.
128	Hagari I, 1933-34	May 1934.
129	Cambodia Co. 2, 1933-34	May 1934.
130	Gadag I (Dharwar-American), 1933-34	May 1934.
131	Surat and Tirupur Cambodia, 1933-34	May 1934.
132	Farm Westerns, 1933-34	May 1934.
133	Kumpta, 1933-34	May 1934.
134	Jagadia, 1933-34	May 1934.
135	Jayawant (Kumpta), 1933-34	June 1934.
136	Dholleras, 1933-34	July 1934.
137	Kalagin, 1933-34	July 1934.
138	Westerns, 1933-34	July 1934.
139	Bailhongal, 1933-34	July 1934.
140	Farm Westerns and Tirupur Cambodia, 1933-34	July 1934.
141	Broach, 1933-34	July 1934.
142	Jagadia, 1933-34	July 1934.
143	Bawla and Kadi, 1933-34	July 1934.
144	Karunganni, 1933-34	August 1934.
145	Navsari, 1933-34	August 1934.
146	Cambodia, 1933-34	August 1934.
147	Kadi-Viramgam, 1933-34	August 1934.
148	Tinnevelly, 1933-34	August 1934.
149	Bagalkote, 1933-34	August 1934.

Summary of Bulletin Series B, No. 17, The Foundations of Yarn-Strength and Yarn-Extension ; Part V-The Prediction of the Spinning Value of a Cotton from its Fibre-properties.

The present paper deals with the problem of predicting the spinning value of a cotton from its fibre-properties. Previous work is discussed, particularly certain suggested relationships between spinning value and staple length alone or in conjunction with fibre-strength, and also between spinning value and fibre-weight ; reference is also made to two other suggested methods of attacking the problem on quite different lines.

Criteria for judging spinning value are discussed, and the criterion finally adopted is the highest standard warp count, i.e., the highest count that can be spun from the cotton with standard twist to give a specified standard strength.

The tests at the Technological Laboratory are described for (1) spinning value, and the following fibre-properties—(2) length, (3) weight per inch, (4) ribbon width, (5) strength, (6) convolutions, (7) rigidity, and (8) clinging power. The results are given for two series ; Series I, in which properties (1) to (7) were determined for 95 samples, and Series II, in which properties (1) to (8) were determined for 45 samples of Indian cottons.

From these results the attempt has been made to derive prediction formulæ for spinning value in terms of the fibre-properties, by means of the method of correlation. This method is briefly explained, together with some of its limitations. It is found that the total correlation co-efficient is 0.87 for fibre-length and spinning value, and —0.75 for fibre-weight per inch and spinning value ; the partial correlation co-efficient of fifth order for the Series I samples is 0.70 for fibre-length and spinning value, and —0.36 for fibre-weight per inch and spinning value. From these results it is clear that the spinning value of Indian cottons is much more accurately assessable from the fibre-length than from the fibre-weight.

The accuracy of the prediction formulæ has been tested by comparing the actual spinning values with those calculated from the fibre-properties by the aid of the formulæ. Using the prediction formula based on fibre-length alone, the difference between actual and predicted spinning values is not greater than 20 per cent. in 69 per cent. of the cases ; the corresponding percentages of cases for other prediction formulæ are 53 per cent. for fibre-weight alone, 76 per cent. for fibre-length and fibre-weight together, with no better result when either fibre-strength or ribbon-width is also included ; and only 80 per cent. when all six properties are included. As the prediction-formula based on six fibre-properties is thus hardly any more accurate than the prediction-formula based on only the two properties of fibre-length and fibre-weight, it is concluded that the greater labour entailed in determining either the ribbon-width, strength, convolutions, or rigidity, is not worth while except for some special reason.

Finally, various anomalies between the actual and predicted spinning values are discussed, and a number of reasons advanced to explain them, and to indicate the lines along which future research might profitably be directed.

Appendix I gives a detailed description of the method of simple and multiple correlation used in obtaining the prediction formulæ, and the formulæ employed in making the necessary calculations; the method of making these calculations is explained. Many prediction formulæ are given, both simple and multiple, and the degree of significance to be attached to the constants in these formulæ is also indicated in a number of cases. Two other methods, used as checks, for determining the constants of the prediction formulæ, are also briefly described. A note is given on the co-efficient of multiple correlation, measuring the correlation between spinning value and all the fibre-properties combined, and having a value for the Series I samples of 0.93, from which it appears that 86.5 per cent. of the variation of spinning value is accounted for mathematically by the six fibre-properties, leaving 13.5 per cent. to be accounted for otherwise.

Appendix II gives a description of a short method for revising the total correlation co-efficients to include further results as they become available in successive seasons.

Appendix III consists of tables of experimental results.

Appendix IV consists of tables showing how actual and predicted values compare.

Appendix V consists of tables of all the total and partial correlation co-efficients calculated in the course of the investigation.

Summary of Bulletin Series B, No. 18, *A Note on the Wax Content of Indian Cottons with special reference to their feel.*

The wax occurring on cotton fibre, though present in extremely small quantities, plays an important part in the spinning, wetting, dyeing, and scouring processes. It has, besides, a direct bearing on its feel as estimated by a grader. The wax content of 11 Indian and 1 non-Indian cottons has been determined, principally with a view to correlating it with its degree of silkiness or harshness. The results obtained show that the wax content of Indian cottons may range from 0.229 per cent. to 0.468 per cent., that the exotic varieties grown in India have, on the whole, a higher wax content than the indigenous types and that the *subjective* estimates of the feel of a cotton, made by different graders, are likely to disagree among themselves and with the results of the wax determination tests. Comparing the reports of the graders with the results of the tests a tentative scale is suggested in which the degree of silkiness of a cotton is expressed in terms of its wax content.

Summary of Bulletin Series A, No. 25, Testing of Indian Cottons for quality at the Technological Laboratory.

One of the main functions of the Technological Laboratory is to undertake fibre and spinning tests on samples of cottons supplied either by the Agricultural Departments, the trade or the mill industry and to issue reports embodying the results of such tests. Tests on agricultural samples were first undertaken at the Laboratory nine years ago, while the testing of trade samples has been in progress for the last four years. During this period nearly 2,500 samples have been subjected to the spinning and fibre tests and, as usual, the testing methods and spinning technique employed at the Laboratory have gradually undergone a process of standardisation. It has been customary in the past to give an account of these methods and technique in the Introduction to the Technological Reports on Standard Indian Cottons, which is an annual publication. However, in view of the fact that the methods and technique remain substantially the same from year to year, it has been decided to describe them in a separate bulletin.

The spinning technique adopted at the Laboratory has been developed especially with a view to obtaining, from tests on small samples, results which should be representative of the bulk sample when tested under mill conditions. The present report gives a description of the Laboratory technique, together with details of machinery, drafts, speeds, etc., employed in the tests.

The fibre-properties measured at the Laboratory are (1) mean fibre-length, (2) fibre-length irregularity, (3) fibre-weight per inch, (4) fibre-strength, (5) fibre rigidity, (6) ribbon-width and (7) convolutions per inch. Methods for the measurement of each property are given, together with a description of the apparatus used. Similarly, an account is given of the methods employed in the determination of the following yarn-characteristics :—(1) lea strength, (2) ballistic strength, (3) actual counts, (4) actual number of turns per inch, (5) yarn evenness and (6) yarn neppiness. The bulletin is brought to a close with the description of the procedure employed at the Laboratory for the determination of the spinning value of a cotton from the results of the spinning tests.

The Effect of Rainfall and Temperature on Percolation through Drain Gauges.—Partial regression equations representing the average drainage observed in any month in terms of the temperature and rainfall of that month, and including terms representing the mean secular rate of change of the drainage discharge and of its regression coefficients on rainfall and temperature, have been fitted to the thirty-six series of observations provided by the three Rothamstead drains in the twelve months of the year.

(2) An account is given of adequate and direct numerical methods of handling equations involving observed quantites, and chosen functions of them, as independent variaties, and of calculating standard errors appropriate to the several sorts of comparison which are to be made.

(3) In the absence of direct knowledge of the amount of water contained from time to time in the soil mass of the gauge it has been customary to assume that the lower average drainage of the summer months is directly due to a greater amount of evaporation taking place in these months. The results of the present enquiry direct attention to a second possibility, namely that the water content of the gauges differs considerably at different times of the year, and that the high drainage in winter is in part to be ascribed to the accumulation of water during the rainy months of autumn, while the lower drainage in summer is due to the partial depletion of the gauges during the lower rainfall of the spring months. The statistical facts bearing on this point are as follows :—

(*i*) When as in Table III allowance is made for the temperature difference between the different months of the year, the distribution of percolation is little altered on all three gauges.

(*ii*) The regressions of drainage on temperature are not uniformly or even predominantly negative, as would be the case if the only effect upon drainage were due to an increase in evaporation. Table VIII shows on the contrary a prevalence in all three gauges of the positive co-efficients.

(*iii*) The discharge from the 60-in. gauge is slightly but significantly delayed in the dates of its annual incidence compared to that of the 20-in. gauge, the 40-in. gauge being in this respect intermediate between the others. This difference can scarcely be ascribed to anything save the greater capacity of the soil in the deeper gauges.

(4) The discharge from all the three gauges has increased slightly during the period of observation, the increase being greatest in the 60.in., and least in the 20-in. gauge.

(5) Both the average drainage and the average response to rain is greatest in the 40-in. gauge ; with respect to the other two gauges the mean drainage is slightly higher for the 60-in. gauge, but the average response to rainfall is greater for the 20 in. gauge.

(6) Very high and remarkable positive regressions of rainfall on temperature are observed for the months of May and September.

(7) During the period of observation the regression of drainage on temperature has tended on the average towards increasing positive values.

(8) The residual variations in drainage, not accounted for in terms of current rainfall and temperature, are in all months compared to the actual values. In March, June and August, however, the standard error of

prediction approaches half an inch. This residue could doubtless be further reduced by using a quadratic function of the monthly rainfall. Variation in previous weather, which, as has been shown, is evidently of great importance in comparing different months, can contribute relatively little to the variation among months of the same kind.

The Application of Modern Methods of Field Experiments for improving the yield and quality of agricultural produce.—Modern methods of field experiments are described. It is pointed out that the old methods of field experimentation were all defective due to the improper layout of the experiment, and consequently inadequate statistical analysis of the results. The principles underlying the modern field technique as developed by Dr. R. A. Fisher at the Rothamstead Experimental Station, together with the statistical processes applicable to the interpretation of results obtained from such well designed experiments are discussed at length with reference to : (1) effect of different manurial treatments on the yield and quality of cotton, (2) the effect of weather on the different varieties of cotton.

New method for the determination of the mean fibre-length and the fibre-weight per inch of cotton.—The prevalent method for the determination of the mean fibre-length and the mean fibre-weight per inch of cotton are capable of giving, in the hands of a trained worker, fairly accurate results, but suffer from the serious defects that they absorb a great deal of time. This restricts their use to technological laboratories and prevents trade and industry from making free use of them. The method described in this paper is based on a new principle and is capable of giving accurate values of the two properties mentioned above in a single operation without sacrificing accuracy, thereby effecting a considerable saving in time. An apparatus has been designed embodying the new methods and details, of this apparatus together with the results of tests on representative cottons are given.

Effect of manure on the yield, fibre-properties and spinning quality of cotton.—The paper embodies the results of an investigation on the influence of different manure in respect of yield, chemical constituents, physical properties and spinning quality of cotton. For this purpose, the material used was Cambodia Co.2 grown in two successive seasons (1928-30) in neighbouring plots under different manurial treatments.

The results indicate that cotton, grown in a plot in which a particular soil deficiency is made up by means of a suitable manure, not only shows a greater yield but a marked improvement in the chemical constituents and physical properties ; on the other hand, excessive manuring on a fertile soil has a decidedly depressing effect. Furthermore, although no significant differences were observed in the yarn-strength results of cottons grown under different manurial treatments, in several cases the manured samples gave less neppy yarns than the unmanured ones. The differences in fibre-properties, etc., due to soil variation have also been discussed.

V. GENERAL.

Sir Richard Jackson, Chairman of the Lancashire Indian Cotton Enquiry Committee, who had come out to India last winter to establish closer relations between his Committee on the one hand and the Indian Central Cotton Committee and the cotton-growing interests of India on the other, paid a visit to the Laboratory on the 12th March 1934. He was taken round the Laboratory and the work in progress in the different sections was fully explained to him.

Extension.—In view of the fact that several sections of the Laboratory have become highly overcrowded owing to the rapid growth of the work of the Laboratory, the writer put up proposals for extension of the Laboratory involving certain additions to its activities. This scheme was considered by the Committee at its meeting held on 26th January 1934, who decided that for the present the extension of the blow-room and the yarn testing room should be taken in hand and that the remaining part of the scheme should first be considered by a small Sub-Committee nominated by the Committee. It furthermore sanctioned the proposals of the writer to overhaul the blow-room plant of the Laboratory which was installed ten years ago and which owing to the many recent improvements in the design and construction of blow-room machinery did not fulfil, in certain respects, the necessary condition of being up-to-date. Accordingly, orders for three new machines for the blow-room have been placed.

Staff.—The staff of the Laboratory on the 31st August 1934, was as follows :—

Director.—Dr. Nazir Ahmad, M.Sc., Ph.D.

Research Laboratory.

Physics Section :—

Senior Research Assistants.—Harirao Navkal, M.Sc.; Ram Saran Koshal, M.Sc.

Junior Research Assistant.—C. Nanjundayya, M.Sc.

Senior Testing Assistant.—S. S. Sukthankar, L.T.C.

Junior Testing Assistants.—K. G. Deo; K. S. Marar, B.A., LL.B.; R. G. Panvalkar, B.Sc.; S. Samson, B.Sc.; M. A. Gangat, B.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc., Tech., M.Sc., A.I.I.Sc., A.I.C.

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Draughtsman.—B. G. Mehta.

Instrument Maker.—Moreshwar M. Patke.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, F.T.I.

Senior Research Assistant.—(Assistant Technologist) D. F. Kapadia, M.Sc., Tech., B.A.

Yarn Testing Section :—

Statistician and Personal Assistant.—V. Venkataraman, M.A.

Senior Testing Assistant.—H. B. B. Joshi, B.Sc.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar ; V. N. Modak, B.Sc. ; L. V. Sundararaman, B.A. ; P. S. Sambamurthy ; G. J. Kharkar, B.Sc. ; A. J. Farid ; U. K. Benegal, B.A. ; P. V. Nachane, B.Sc. ; A. B. Khan, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—M. T. Sundaram ; M. A. Marar.

Laboratory Keeper.—H. P. Sethna, B.Sc.

The writer proceeded on leave out of India from 13th March 1934 to 31st August 1934 including one month's deputation in England as decided by a resolution passed by the Standing Finance Sub-Committee on 20th July 1934. During my absence Mr. R. P. Richardson, Spinning Master, in addition to carrying out his own duties, officiated as Director of the Laboratory.

Dr. R. N. Mathur, Temporary Research Assistant, was relieved on 16th May 1934 on the termination of his temporary period of appointment.

Mr. A. B. Khan, who had previously acted as Temporary Junior Tester, was appointed as a permanent Junior Tester to an additional post created by the Committee at its meeting held on 26th January 1934.

A new post of an additional machineman was sanctioned by the Committee and filled up during the period under review.

Two posts of Senior Testers hitherto vacant were filled up from among the present staff of Junior Testers ; the corresponding two posts in the Junior Tester cadre having been abolished.

Mr. D. F. Kapadia, Senior Research Assistant, received an offer of appointment as Head of the Textile Department in the Victoria Jubilee Technical Institute and was permitted to join this new post from 1st July 1934.

The temporary post of Personal Assistant was extended for a further period of one year and Mr. V. Venkataraman continued to hold that post in addition to his own duties.

Mr. H. B. Joshi continued to be in charge of the Yarn Testing Section.

Exhibits.—The preparation of lint, sliver and yarn exhibits from improved varieties of Indian cottons for purposes of display at fairs and exhibitions has now become an annual feature of the activities of the Laboratory. During the period under review a set of 10 cases containing exhibits as detailed below was sent to the Indian Empire Exhibition which was held in Lahore in January 1934 :—

Exhibits comprising (1) card sliver, (2) $\frac{1}{4}$ hank yarn knots (2 of each), (3) yarn bobbins (4 of each), (4) black winding card and (5) halo length cards, prepared from the following Indian cottons :—

(1) Jayawant (Kumpta).
(2) Gadag I (Dharwar-American).
(3) Surat 1027 A.L.F.
(4) Wagad 8 (Dholleras).
(5) Umri Bani.
(6) Verum 262 (Nagpur).
(7) Nandyal 14 (Northern).
(8) Hagari I (Western).
(9) Cambodia Co. 2 (Cambodia 440).
(10) Punjab-American 4F.

In addition 10 cardboard boxes containing small samples of the cottons referred to above were also sent.

Again, the following exhibits were sent to the office of the High Commissioner for India for purposes of display in the Samples Room of India House, London.

Exhibits comprising (1) lint, (2) Baer Sorter pattern, (3) ½ hank yarn knot (2 of each), and (4) halo length cards from the following cottons :—

(1) Jayawant.
(2) Gadag.
(3) 1027 A.L.F.
(4) Wagad 8.
(5) P. A. 4F.
(6) P. A. 289F.
(7) Aligarh A19.
(8) Mollisoni.
(9) Verum (Akola).
(10) Verum (Nagpur).
(11) Umri Bani.
(12) Cambodia Co. 2.
(13) Nandyal N.14.
(14) Hagari I.
(15) Karunganni C7.
(16) Banilla.
(17) 4F-98 Sakrand.
(18) 289F-1 Sakrand.
(19) Improved Sind Sea-Island 2-4.
(20) Improved Sind-Egyptian Boss III-16.

Apparatus and Equipment.—During the period under review the following machines and apparatus were acquired for the Laboratory :—

(1) Barnstead Distilling apparatus.
(2) Goodbrand's Yarn Wrap Reel.
(3) Electrically driven Twist Counter.
(4) Munroe Calculating Machine, hand and electrically operated.

ACKNOWLEDGMENTS.

I wish to express my deep sense of gratitude to the office-bearers of the Indian Central Cotton Committee for their unfailing support and many valuable suggestions, to Major Ellis Jones and Mr. C. P. Bramble, for their kindness in furnishing valuation reports which form an integral part of the spinning test reports issued from the Laboratory, to the office-bearers of the East India Cotton Association and the Karachi Cotton Association, Karachi, for kindly agreeing to give valuation reports on samples of cotton in connection with the investigations in progress at the Laboratory, to Messrs. Volkart Brothers, Karachi, for their kindness in providing facilities for the investigation on the deterioration of cotton stored in Karachi. My thanks are also due to the members of the staff of the Laboratory who have consistently and loyally helped me in the completion of the work described in this report.

NAZIR AHMAD,
Director, Technological Laboratory.

Dated the 15th November 1934.

CHAPTER VI.

REPORT OF THE PUBLICITY AND PROPAGANDA OFFICER FOR THE YEAR ENDING 31st AUGUST 1934.

INTRODUCTION.

In presenting the Annual Report for the year ending 31st August 1934, the Publicity Department can look back on a period of development in the range of its activities which augurs well for the initiation of efforts in new and unexplored directions. It may be claimed without extravagance to have prepared the ground for a multitude of fresh regions of effort, by covering, within the limits of its resources, the entire range of possibilities in the direction of publicity and propaganda. It is scarcely possible to place a limit to the extent to which modern publicity and propaganda can be pushed in conjunction with the available long-range mechanical contrivances of communication ; nevertheless, the Department has reached a stage in the realm of its activities at which it can look forward to the prospect of an ever-widening sphere of work with undiminished assurance.

The broadcasting of informational literature, the spread of scientific and practical knowledge relating to the improvement of cotton, and foreign propaganda have all been sustained at a standard of efficiency which can be evidenced from the growing demand on the Intelligence Service of the Department from Government Departments and Public bodies in India and abroad, which the campaigns of the Department have stimulated.

NOTABLE EVENTS.

Of the more notable events, mention must be made of the " field propaganda," besides a large variety of publicity and propaganda work carried on in other directions, undertaken by touring through important centres, for popularising improved cotton cultivation in the Barrage Areas in Sind, especially in the Right Bank areas where cotton cultivation was never attempted before, for the demonstration of the superiority of Jayawant cotton over the local Kumpta variety and its extension in the Dharwar District and for the furtherance of the " Clean-up " campaign launched by the Bombay Department of Agriculture in a selected area of 180 sq. miles in Gujerat, for the removal immediately after the harvest of all cotton stalks and stubbles and for the eradication of alternative host plants, in order to convince the cotton cultivators that a substantial yield in *kapas* could result by starving the Spotted Boll-worm which does considerable damage to the crop. The many-sided activities of the Committee include botanical,

physiological, entomological and mycological investigations at various research stations into improved strains, crop growth, life-history of cotton pests and measures to combat them as well as of measures to avert wilt and root-rot. Knowledge of the outcome of these investigations brought out in a vivid and intelligible fashion is calculated to influence farm practice in a very salutary way and may also aid in calling public and Government's attention to the possibilities of avoiding the enormous losses which result from uninformed cultivation. The Department gave special attention to the Committee's work in this direction in Madras, in its broadcasting campaigns. The publication by the Department of the results from the Madras Herbaceum Scheme and the Fodder Cholam Scheme has had a very decisive effect in guiding the farmers in planning important crop adjustments and in reducing the acreage of some varieties while increasing the acreage of others.

PROPAGANDA.

The propaganda during the year included a comprehensive scheme of campaigns at home and abroad by means of Press *Communiqués*, Pamphlets, Brochures, Leaflets, the publication of Summary Proceedings of the Committee's meetings for the benefit of trade organizations and public bodies, Posters, Exhibitions and Shows, and in some cases personal tours through important centres.

PRESS *COMMUNIQUÉS*.

Early during the year under report, fourteen Press *Communiqués* dealing with the experiments carried on at Hyderabad, at the Committee's Laboratory at Matunga, at the Institute of Plant Industry, the United Provinces Entomological Scheme, Botanical and Agricultural Research in the Punjab and several other schemes were issued and published both in the Indian and the British Press in a manner that served to emphasize the national, international and imperial value of Indian cotton. These were followed up with eight other *communiqués* dealing with the results obtained from the various research schemes functioning during the year.

The following *communiqués* received wide publicity, some of them in most of the British cotton trade journals :—

1. Proceedings of the 27th meeting of the Indian Central Cotton Committee.
2. Proceedings of the 28th meeting of the Indian Central Cotton Committee.
3. Hyderabad quest for better Gaorani.
4. Safety-first measures against importation of cotton pests.
5. Testing of Indian cottons at the Matunga Laboratory.
6. The Institute of Plant Industry, Indore.
7. The United Provinces Entomological Scheme.

8. Botanical and Agricultural Research in the Punjab.
9. The Punjab Root Rot Scheme.
10. The Punjab Pink Boll-worm Scheme.
11. The White Fly Damage to the Punjab cotton crop.
12. Defibrating and Delinting of cotton in the Punjab.
13. Bikaner Gang Canal Scheme.
14. Harmful effects of Cholam in succeeding cotton crop.
15. Cotton Leaf Hopper in the Punjab.
16. Review of the Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1933.
17. Cotton Research in the Punjab.
18. Pempheres and Physiological Scheme.
19. The Madras Herbaceum Scheme.
20. Madras Fodder Cholam Scheme.

In addition, a special series of articles drawing attention to the Technological Laboratory's work at Matunga in the following directions were issued :—

(1) High Draft Spinning and their Importance.
(2) Yarn testing and its importance to cotton mills.

These two articles dealt with the experiments conducted at the Committee's Laboratory at Matunga, on spinning and yarn testing, and the importance of its useful findings to the trade and cotton mills.

Two other articles dealing with " Promotion Activities with respect to India's cotton production this year and thereafter " and " Commercial Survey of Indian Cottons " were also issued detailing the Committee's seed extension schemes in progress and the prospective ones, and improved varieties of cotton grown in different parts of India.

PAMPHLETS.

An account of the detailed study of the life-history and habits of the spotted boll-worm in South Gujerat, estimate of damage caused by this pest and the various control measures tried was prepared, following the collaboration that took place between the Bombay Department of Agriculture and the Publicity Department of the Indian Central Cotton Committee in the Clean-up campagin at Broach. Another finely printed, colour illustrated pamphlet indicating (*a*) the improved type of Punjab American (4F-18) being more suitable for the Right Bank section of the River Indus under perennial

irrigation assured by the Lloyd Barrage Canals than 27 W.N. (improved Deshi), (*b*) seed rate and irrigation and (*c*) time and method of sowing was prepared and 1,500 copies were distributed in the Sind area.

BROCHURE.

A profusely illustrated brochure entitled "The Indian Central Cotton Committee, its objects, activities and achievements, with special reference to the Punjab, Sind, the United Provinces and Central India" was published in December and freely distributed at the Indian Empire Exhibition at Lahore to people who showed interest in the exhibits that were put up at our stalls. Up-to-date information about cotton legislation for which the Committee is responsible and the variety of fruitful work done by it under various agencies aroused great interest.

LEAFLETS.

A comprehensive series of leaflets was also published during the year in English and various vernaculars and widely distributed. The following list gives in brief detail the activities of the Department in furthering educational efforts by means of printed publications to broadcast findings of great economic importance.

(1) "*Hyderabad Botanical Scheme*" printed in Urdu, Kanarese and Marathi, describing work done by the Committee in co-operation with the Nizam's Government, for evolving a strain of Gaorani of higher yield. Copies of this leaflet were forwarded to the Secretary to the Nizam's Government, the Director of Agriculture, Hyderabad, the Cotton Research Botanist, Parbhani and to the Vernacular Press.

(2) "*Institute of Plant Industry, Indore*" was another such leaflet detailing the causes which led to the establishment of the Institute and dealing with the importance of the work carried on there, an English version of which provoked favourable comment on its achievements from the *Empire Cotton Growing Review.*

(3) "*Verum Cotton.*" This Hindi leaflet describes the Co-operative scheme started in 1930-31 with the object of securing an adequate price for the growers and maintaining supplies of pure seed. 1,200 copies of this were printed and a large number of them were forwarded to the Director of Agriculture, Central Provinces, for distribution.

(4) Copies of the illustrated leaflet in Gujerati entitled "Get More Money for your cotton crop by removing roots with a plant-puller and thus exterminate the Boll-worm" were reprinted for distribution in the Broach District. A handbill illustrating the plant-puller was also printed to accompany the leaflet.

Four other leaflets issued earlier in the year in English and the appropriate vernaculars dealt with the problems of cotton growing and its rotation crops in the Central Provinces and Berar and the work done on them by

the Botanical Section, Nagpur and at the Akola Farm, with the marketing of Verum cotton and seed distribution in the Central Provinces and Berar, the improvement of Broach cotton, Cotton Research in the Punjab and the Hyderabad Botanical Scheme.

POSTERS, EXHIBITIONS AND DEMONSTRATIONS.

Posters with featuresque exposition can become a powerful vehicle of propaganda and are an impressive means of establishing indelible impress on the public mind with the minimum of effort and the maximum of effect. The poster "India's bid for Supremacy in the World's Cotton Markets" had a wide publicity in Britain and Germany and two new posters, one in Sindhi, "It pays to grow cotton in Sind," and the other in Kanarese featuring a Jayawant plant and money falling from it into a *dokra*—a typical bag used for gathering cotton—were printed in consultation with the Chief Agricultural Officer in Sind and the Director of Agriculture, Bombay.

The Publicity and Propaganda Department participated in the Indian Empire Exhibition held at Lahore during December 1933 and January 1934, and two stalls were engaged by the Committee for the display of improved types of Punjab and other cottons, yarns, etc. The exhibits consisted of (*i*) improved Punjab-American and *Deshi* cottons, (*ii*) improved types of cotton, yarn, etc., prepared at the Matunga Technological Laboratory, (*iii*) Sind-American, Sind-Egyptian, Sind-Sea Island and Sind *Deshi* cottons and seed, together with instructive charts showing particulars of staple, sowing date, and multiplication schemes, (*iv*) Posters in English, Hindi, Urdu, Gurmukhi and Sindhi, giving information regarding India's cotton trade, (*v*) Art Photographs showing the storing and marketing of cotton, (*vi*) the Baer Sorter, Balls Sorter and O'Neill's Hair Tester for demonstrating how the staple length, percentage of fibres and strength of fibre respectively are determined, (*vii*) two Jenkins' Clod-Crushers recommended for use in Sind. The demonstrations mentioned under (*vi*) were a special feature of our stall.

A quantity of posters, bulletins and leaflets and folders in English, Hindi and Urdu was despatched to the Extension Officer of the Institute of Plant Industry for distribution at the Agricultural Exhibition which he had organized in Bharatpur State.

The Department also took part in the All-India Khadi Exhibition, Bombay, under the joint auspices of the Bombay Swadeshi League and the All-India Spinners' Association, with a display of cotton and yarn exhibits. In compliance with a request from the Secretary of the Exhibition Committee, 16 samples of *kapas* with an equal number of lint samples from the following cottons were attractively exhibited :—

(1) Jayawant, (2) Gadag I, (3) Surat 1027 A.L.F., (4) Wagad 8, (5) 4F, (6) Punjab-American 289F, (7) Mollisoni, (8) Aligarh A19, (9) C.402 (Madho-

ganj), (10) Verum 262 (Nagpur), (11) Verum 262 (Akola), (12) Umri Bani, (13) Cambodia Co. 2, (14) Nandyal 14, (15) Hagari I and (16) Karunganni C7. During the time the Exhibition lasted, the exhibits displayed served to bring home to enormous numbers of people the importance of cotton in the indigenous industry of the country. Publicity literature and a number of posters and leaflets already printed, of which mention has been made above, were widely distributed and the co-operation of the Department in making the Exhibition a success was warmly acknowledged by the Committee of the Exhibition.

Another exhibition at which the Publicity Department took occasion to make widely known the varied activities of the Committee in furtherance of the cotton industry of the country was the Indore Exhibition organized by the Indore State Administration at which large numbers of leaflets describing the work done by the Institute of Plant Industry, Indore, were distributed.

Agricultural Show at Chikodi, in the Belgaum District, was another show at which the display of a specially designed poster demonstrating the superiority of Jayawant cotton over the local Kumpta variety proved very useful, in addition to the distribution of publicity literature and demonstration on the working of seed multiplication and distribution scheme of Jayawant cotton organized by the Deputy Director of Agriculture, Dharwar, and the Cotton Superintendent, S.M.C., Dharwar.

TOURS.

The supplementing of publicity and propaganda through the distribution of descriptive literature with personal tours conducted over important areas on important occasions during the trade season helps to reinforce the scope of publicity campaigns with something more lasting than would otherwise be the case. There is also no gainsaying the very vital need for the Department to be in constant contact with the varying needs and regional peculiarities of different cotton-growing centres in the country. With a view to ensuring this, the Publicity Officer took opportunity to undertake frequent tours at regular intervals over important areas during the year. Mention must be made of his presence at the meeting of the Provincial Board of Agriculture at the invitation of the Chief Agricultural Officer in Sind and the exchange of views that took place regarding the best methods of giving wide publicity at large railway stations, at which the Publicity Officer was in a position to give very suggestive hints, and also about the Committee's Physiological and Seed Distribution Schemes in Sind. His presence at the fourth meeting of the Sind Cotton Committee on 3rd December 1933 enabled him to offer useful opinions on the question of the utilization of *Zamindari* lands for the extension of agricultural improvements as propaganda demonstrations to the cultivators. He also visited Lahore and Lyallpur to improvise the requisite publicity schemes for making known the Committee's work in Northern India at the Indian Empire Exhibition and toured through the Faridkot, Nabha, Jind, Patiala and Bahawalpur States to impress upon the owners

of cotton pressing factories the desirability of submitting Weekly Press Returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of the week, regularly and punctually. Later in the year, he visited Coimbatore, Koilpatti and other important centres in the Madras Presidency. He also attended the fifth meeting of the Sind Cotton Committee held on the 14th June at Karachi at which various steps which would help to accelerate the pace of demonstration and propaganda work in the Barrage area was discussed. Later on, he also visited a number of cotton centres in the Hyderabad District. These tours were found to be of great value in keeping the Publicity Officer in intimate personal touch with propaganda problems.

FOREIGN PROPAGANDA.

The fruitful results of the publicity and propaganda carried on in Great Britain and the Continent and U.S.A. in the West and Japan and other countries in the East can be evidenced from the great interest evinced by organs of commercial opinion in these countries and the readiness with which leaderettes bearing on the progress of the Indian cotton industry based on material furnished by the Publicity Department of the Committee, were inserted in important trade journals. The fact that widespread interest is being taken abroad in the growth of improved varieties of cotton is something of which the Committee can be proud ; because the dispelling of ill-informed opinions about the unsuitability of Indian cottons to foreign requirements and the growing recognition of the immense strides taken in the country's cotton industry is an assurance of abiding promise. Among the important organizations which received the publicity material may be mentioned the Lancashire Indian Cotton Committee, Manchester; International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester; Fine Cotton Spinners' and Doublers' Association, Ltd., Cheshire ; Oldham Master Cotton Spinners' Association, Oldham; British Association of Managers of Textile Works, Bolton; United Textile Workers' Association, Oldham; Japan Cotton Trading Company, Bombay ; Gosho Kabushiki Kaisha, Ltd., Bombay; Sri Krishna Mills, Ltd., Mysore; Toyo Menka Kaisha, Ltd., Bombay, etc. The following are some of the foreign journals which inserted leaderettes based on material furnished by the Publicity Department of the Committee :— *Cotton Trade Journal*, U.S.A.; *The Empire Cotton Growing Review*, London; *The Textile Recorder*, Manchester ; *The Textile Weekly*, Manchester ; *The Textile Manufacturer*, Manchester.

PROPAGANDA TO PROMOTE COTTON CULTIVATION ON INDUS RIGHT BANK AREAS.

The promotion of cotton cultivation on the Indus Right Bank areas came in for an intensive spell of special propaganda. As stated earlier in the report, a colour illustrated pamphlet indicating the approved type of cotton suited for cultivation in these areas, seed rate and irrigation and time and method of sowing was widely distributed and was followed up, during

the visits to these areas by the Publicity Officer, with Press propaganda and special illustrated articles in the local Press. An illustrated leaflet dealing with the improved strains evolved at Sakrand from the four main classes of cotton, viz., Punjab-Americans, Imported Americans, Sind *Deshi* and Imported Egyptians and the extension of improved seed with the financial assistance of the Indian Central Cotton Committee, was issued by the Publicity Department. Copies of this leaflet were also sent to all countries consuming Indian cotton, in Europe, U.S.A., China, Japan, E. Africa, Malaya and Australia. This was supplemented by the issue of a poster entitled "It pays to grow cotton in Sind" drawing attention to the economic superiority of cotton cultivation over that of jowar or rice. In view of its popularity and at the suggestion of Sir Richard Jackson that it should be given wide publicity in England and on the Continent, photographs of it were taken and were given prominent place in numerous British and Indian journals.

ENCOURAGING CULTIVATION OF JAYAWANT.

The Department also pursued a similar campaign in the Karnatak for popularising Jayawant cotton in preference to the local Kumpta variety, by the issue of an attractive poster in Kanarese, the wide display of which was facilitated by the Chikodi Agricultural Show, held in March. The posters were of great use and were productive of great influence on the progress of Jayawant cultivation in the areas demarcated for the purpose. The Director of Agriculture commended it as " a very good one."

BROACH CLEAN-UP CAMPAIGN.

The Clean-up campaign in Broach was reinforced by the issue of an illustrated leaflet in Gujerati, " Get more money for your cotton crop by removing roots with a plant-puller and thus exterminate the Boll-worm." This was supplemented by a handbill vividly illustrating the plant-puller at work.

CONCLUSION.

It is a matter for genuine gratification that the work of the Department was greatly facilitated by the wholehearted co-operation of the heads of the Agricultural Departments concerned. Particular mention must be made of the valuable assistance given to the Publicity Officer by the Chief Agricultural Officer in Sind and the Director of Agriculture, Bombay Presidency, in the prosecution of the Department's programme in Sind and Bombay Presidency and the readiness with which they placed their suggestions and the benefit of their experience at the disposal of the Department.

R. D. MIHRA,
Publicity and Propaganda Officer.

APPENDIX I.

LIST OF RESOLUTIONS.

"That the Indian Central Cotton Committee marks its approval in a very cordial manner of the work done by Sardar Rao Bahadur B. R. Naik and Mr. Vonesch as delegates of this Committee in connection with the Indo-Japanese trade negotiations."

"That the best thanks of the Committee be voted to His Excellency the Governor for the honour he had done in visiting us this morning."

"The Indian Central Cotton Committee thanks the East India Cotton Association and the Karachi Cotton Association for their co-operation in the preparation of common standards for Indian cottons. It is confident that this step towards unification will, in time, prove to be of considerable advantage both to the grower and the trader."

"That in regard to the unification of weights for *kapas* the Indian Central Cotton Committee approves of the policy advised by the Governments of Bombay and the United Provinces, viz., that both the Railway maund of 82 2/7 lbs., which is based on the tola, and the *khandy* of 784 lbs., which is based on the pound avoirdupois, should be retained and that efforts should first be concentrated on the elimination of unauthorized maunds and unauthorized *khandies*."

"That the Budget of the Institute of Plant Industry, Indore, for 1934-35 be reduced by Rs. 40,000, or such sum as the Standing Finance Sub-Committee might decide."

"In view of the low prices of cotton continually for the last four or five years, the Indian Central Cotton Committee earnestly requests the Indian Government to prevail upon the Railway Board to reduce the railway freight on cotton so as to afford relief to the agriculturists."

"That the Indian Central Cotton Committee desires to remind the Government of India of its Resolution passed at its meeting on the 29th August 1933 and wishes to draw the attention of Government to the dangerous increase in the evil of watering of cotton which calls for immediate action in the interest of Indian cotton."

"That the Indian Central Cotton Committee endorses the resolution of the Special Sub-Committee regarding the establishment of a compact block of long-staple cotton in Sind and approves generally of the proposals of the Chief Agricultural Officer in Sind."

"That the various suggestions of the Sind Cotton Committee be referred back to the Chief Agricultural Officer in Sind for reconsideration by the Sind Cotton Committee with the object of ascertaining to what extent any of the suggestions made could be given effect to."

"The Indian Central Cotton Committee approves of the action taken by the Standing Finance Sub-Committee in regard to the question of the reduction of the Bombay Port Trust share of fumigation charges and the revision of the pay and allowances of the fumigation staff."

"The Indian Central Cotton Committee requests the Government of India to sanction a rebate of eight annas per square bale and five annas per round bale on the fumigation fee paid on American cotton fumigated at square bale and round bale rates during the fiscal year 1933-34."

"The Indian Central Cotton Committee approves of the action taken by the Local Sub-Committee in recommending to the Government of India the abolition of the special fee of Rs. 10 for sample bales."

"This Committee resolves that the Governing Body of the Institute of Plant Industry, Indore, be informed—

(1) that the representation of the Indian Central Cotton Committee on the Governing Body each year should be in proportion to the contributions received in the preceding year from the Indian Central Cotton Committee and the States taking an interest in the Institute,

(2) that the accounts of the Institute should be audited by the Auditor-General as long as contributions from the Indian Central Cotton Committee continue,

(3) that the Indian Central Cotton Committee will contribute to the Institute for a period of three years from 1935-36 a minimum sum of Rs. 35,000 per year for purposes of research work in cotton—the programme for such work for each year to be approved by the Indian Central Cotton Committee. The Committee will also be prepared to consider applications for supplementary grants for cotton research on the approved programmes, if necessary."

"That the Resolution of the Committee passed at its meeting in July 1928 requiring a cold weather meeting to be held at Indore once in three years be rescinded. Meetings will be held at Indore as and when the Committee considers it desirable to do so."

"That the Indian Central Cotton Committee desires to express its thanks to the Governments of Bombay, Madras, Punjab, United Provinces and Central Provinces for the steps taken by them to give effect to the Committee's recommendations for the introduction of common units of weight for cotton transactions. The Committee would further urge on the Bombay Government the desirability of standardising also the Bombay *khandy* of 784 lbs. as a unit of weight in the Presidency, particularly as this unit is being adopted in practically all the other major cotton growing provinces in India."

"That the Indian Central Cotton Committee requests the Government of India to resume the broadcasting of all commercial news connected with cotton in the mornings particularly through the Bombay Radio Station."

APPENDIX II.

INSTITUTE OF PLANT INDUSTRY, INDORE, CENTRAL INDIA.

Annual Report for the Year ending June 30th, 1934.

ADMINISTRATIVE AND GENERAL.

1. *Board of Governors' Meeting.*—The Board of Governors met on December 20th, 1933. The report for the year ending June 30th, 1933, was considered, together with a supplementary note on progress up to November 30th, 1933, and the programme for the year 1933-34 was discussed and approved.

2. *Contributing Members of the Institute.*—During the year Alwar State has become a member of the Institute, and it is satisfactory to record that the State immediately obtained the services of one of the Institute's research students for one year in order that there might be no delay in initiating the work of agricultural improvement.

At the closing date of this report the following twenty-one States in Central India and Rajputana were members of the Institute, arranged in order of joining :—

Indore.	Sitamau.	Jhalawar.	Partabgarh.
Dhar.	Narsingarh.	Bikaner.	Orchha.
Jaora.	Tonk.	Rewa.	Bharatpur.
Datia.	Bijawar.	Jaipur.	Jodhpur.
Rutlam.	Barwani.	Bundi.	Alwar.
Dewas (Senior Branch).			

Financial stringency, which causes hesitation over new expenditure, however desirable, still prevents a number of other States from becoming members.

3. *Staff and Students.*—Mr. J. B. Hutchinson, M.A., took up his appointment as Geneticist and Botanist on August 24th, 1933.

The Board of Governors sanctioned the creation of two new posts in the Genetics and Botany section, those of Statistical Assistant and Genetical Assistant. The former was filled by the transfer of Mr. V. G. Panse from the post of Chemical Assistant. The latter was filled by the appointment of Mr. Bholanath on the expiry of his Research Scholarship from the Indian Central Cotton Committee on June 1st.

The post of Senior Botanical Assistant is advertised, and will be filled shortly. The post of Chemical Assistant remains vacant at present.

Mr. Phadke, Junior Farm Assistant, remained on deputation to Bharatpur State as Agricultural Officer throughout the year.

4. *Visitors.*—The following were among the visitors to the Institute during the year :—

Apte, M. S., Captain, Gwalior.
Awasia, Motilal, Dewan, Sitamau State, C. I.
Azizuddin Ahmad, Sir, Prime Minister, Datia State, C. I.
Beckwit, F. S., U. C. C. Mission, Indore.
Bhawar Singh, Kunwar of Kathiwara,

Bingley, B. R., Registrar, Co-operative Societies, Holkar State, Indore.
Cains, J. F.
Chaturbhuj, C. G., Treasury Officer, Dewas (Junior).
Davis, D., Irrigation Engineer, Holkar State, Indore.
Dabral, B. M., Cotton Physiologist, Agricultural Research Station, Sakrand.
Dhanda, H. L., Manager, Indore Electrical Supply, Indore.
Dyer, J. F., C.I.E., I.C.S., President, State Council, Bhopal, C. I.
Fateh Singh, Rao Sahib, Jailor, Central Jail, Ajmer.
Fitze, K. S., C.I.E., I.C.S., Political Agent in Malwa, Indore.
Fleming, R., Secretary, Lancashire Cotton Enquiry Committee.
Govindram, Seth, Finance Member, Jaora State, C. I.
Grant, Rev. C. F., U. C. C. Mission, Banswara.
Guru Prasad, B.A., LL.B., Industries Minister, Rewa State.
Hari Mohan, Private Secretary to H. H., Jhalawar State, Rajputana.
Hiralal Kalyanmal, Rai Bahadur, Indore.
Hudson, Dr. P. S., Deputy Director, Imperial Bureau of Plant Genetics, Cambridge.
Jackson, Sir R. H., Chairman, Lancashire Cotton Enquiry Committee.
Jagdish Singh, Thakur, M.A., LL.B., Dewan, Narsingarh State, C. I.
Jawalkar, B. L., Land Records Officer, Dewas (Junior).
Jha, M. S., Zamindar, Aligarh, U. P.
Kanungo, S. V., Finance Minister, Holkar State, Indore.
Kasturbhai Lalbhai, Seth, Ahmedabad.
Keyes, Brigadier-General Sir Terence, K.C.S.I., Adviser to H. H., Gwalior.
Khandekar, R. K., Professor of Literature, Ferguson College, Poona.
Kibe, S. M., Sardar, Holkar State, Indore.
Kothare, G. R., Rao Bahadur, Member, Indian Central Cotton Committee, Berar.
Krall, H., Prof. of Chemistry, Agra College, Agra.
Kulkarni, V. D., Pleader, Belgaum.
Kulkarni, G. D., Chief Secretary, Ichalkaranji (Deccan).
Likhite, Dr. V. N., Department of Agriculture, Baroda State.
Macmillan, Rev. J., U. C. C. Mission, Bagli.
Macnabb, The Hon'ble Lt.-Col. R. J., I.A., Agent to the Governor-General in Central India, The Residency, Indore.
Madgaonkar, Sir Govind, Adviser to H. H. the Maharaja Holkar, Indore.
Mahipal Singh, Raja of Sarila.
Mehta, Chunilal B., Member, Board of Governors, I. P. I., Bombay.
Mulk Raj, Chief Revenue Officer, Dhar State, C. I.
Murari, L. T., Livestock Research Station, Hosur.
Nadkar, K., Dewan Bahadur, Dewan and President of Council, Dhar.
Pandey, B. P., Major, B.A., LL.B., Dewan, Orchha State, C. I.
Parkhi, T. V., B.Sc., Court of Wards, Gwalior.
Rama Reddi, P. H., M.A., B.Sc., I.A.S., Secretary, Indian Central Cotton Committee, Bombay.
Rode, K. P., Professor, Benares Hindu University, Benares.
Roy, N. N., Member Council, Rutlam.
Runciman, Rev., Udaipur.
Runciman, Mrs.
Sampatkumaran, M. A., Professor of Botany, University of Mysore, Central College, Bangalore.
Shargha, H. K., B.A., LL.B., Kamdar, Gaurihar, C. I.
Shukla, R. S., Revenue Commissioner, Orchha State.
Taylor, Dr. J. T., U. C. C. Mission, Indore.
Taylor, Dr. A. C., U. C. C. Mission, Rutlam, C. I.
Trench, C. G. C., C.I.E., C.S., Settlement Commissioner and Revenue Commissioner, Udaipur, Rajputana.
Trench, Mrs., Udaipur.
Watson, J. C., Christian College, Indore.
Whitburn, T., Tikamgarh, Orchha State.
Wills, C. O. U., Special Officer, Jaipur State.
Wylie, F. V., Prime Minister, Alwar State.

5. *Library.*—Accessions during 1933-34 :—

Text-books and Works of Reference	67
Volumes of Journals	177
Reports and Bulletins..	430
Total accessions	674

Four new Journals have been added to the list of periodicals taken in the Library.

Classification of the Library material according to the Universal Decimal System followed by the Imperial Agricultural Bureaux is in progress.

One hundred and fourteen periodicals were lent to other Research Workers in India. Applications for loans amounting to about 120 publications, including translations from foreign languages, were made from outside institutions.

A large number of Institute publications have been circulated to member-States, Indian Provincial Departments and foreign Agricultural Experiment Stations and Institutions. Attached to the Library is a small book depôt of standard works on Indian Agriculture. During the year under report 859 books and Institute Bulletins were sold and 2,594 are in stock.

Research Work.

6. *Organization.*—During the year the expansion noted in last year's Progress Report has continued. A small greenhouse has been erected for the Genetics and Botany section to enable genetic and plant breeding work on cotton to be speeded up by growing two generations a year. Extra laboratory bench space is being provided, a considerable quantity of new research equipment has been added and store room accommodation rearranged, to facilitate the execution of the expanded experimental programme.

The appointment of a Statistical Assistant has led to improvement in the guidance of experimental work in States, and is making possible an investigation into the potentialities of regional co-ordination of field trials. Such co-ordination is expected to provide immediate benefit to the States in the shape of results of greater reliability and wider application, while the development of more accurate methods of regional testing of cotton varieties will be of value to cotton workers throughout India.

It is fitting to acknowledge here the willing co-operation both of the Darbars, and of the officers and voluntary workers concerned, of the various States who undertook to carry out these field experiments. Valuable results have been achieved, and little or none of this important work could have been done without their willing co-operation.

Acknowledgment is also due to the Provincial Agricultural Departments, notably those of Bombay, the United Provinces, the Central Provinces and the Punjab for much assistance and co-operation willingly rendered; also to Agricultural Departments in the U.S.A., Canada, Australia, South Africa, Uganda, Nyasaland and Morocco, and to officers of the Empire Cotton Growing Corporation.

7. *Weather and its effect on crops.*—For the third year in succession the monsoon rains were in excess. They broke on June 18th and thereafter in Malwa their distribution was much too continuous for the well-being of the *kharif* crops. Cotton suffered much, though not quite so badly as in 1931 and 1932. In most parts of Rajputana and in the Nimar tract of Central India, however, excellent crops were the rule.

Rabi crops promised to be good but considerable damage was done by frost in mid-January. Tobacco was almost completely destroyed and gram suffered heavily in many places. Wheat escaped serious damage in most districts.

8. *Cotton.*—

(*i*) *Botanical and Genetical.*

(*a*) *The creation of a superior strain of barani (rain-watered) Malvensis* cotton forth Malwa plateau has been in progress since 1925, and has now reached the stage o multiplication and distribution. The work of the year under review eliminated three of the five types retained for further test last year. Of these one has been distributed for the 1934-35 season, and the other is being further propagated for distribution later. On the average of ten fully replicated trials carried out in the Malwa plateau, these two strains yielded 20 per cent. more *kapas* than the local controls, and one of the two strains ginned 32 per cent. and the other 29 per cent. as against 28 per cent. from the local. The mean maximum halo lengths of these types are 23 and 21 mm. respectively. In four spinning tests the best of these two types has averaged 15's as against 12's from the local.

Examination of the variances of individual components of yield and quality in these strains revealed the fact that although they are well up to the ordinary plant breeding conception of a pure line, they retain sufficient variability to serve as a basis for further selection. In the design of the seed distribution scheme, the maintenance of the pure nucleus stock has been so arranged that further selection can be exercised at the same time, and an investigation prosecuted into the effects of selection on individual components of yield and quality in material of relatively low variability. For this investigation it has been essential to improve the methods of comparing plant breeding material. As an experimental measure, therefore, the progeny rows for 1934-35 have been laid out in randomised blocks of very small plots.

In the course of tours during the 1933-34 cotton season, fresh selections were made from cultivators' fields of cotton in five States in the black cotton soil area, four in the lighter soil areas of Rajputana and two in the Nerbudda valley (Nimar). These were examined at the Institute and the best of them will be grown in the coming season either at the Institute or with the assistance of a State Department in the Nimar tract. An attempt is being made to speed up the acquisition of information concerning these strains also by replication and randomisation in the initial stages.

Multiplication plots were grown on cultivators' land at a very thin seed rate, in order to obtain the maximum increase in seed. The crop was consequently thin, and rather later than crops at commercial spacings. In spite of these disadvantages and the consequent greater damage suffered from frost, both strains proved exceedingly popular, and not only has it been easy to secure the best cotton land in villages close to the Institute for the coming season's multiplication plots, but the whole of the Institute's stock of mass selected seed has been sold in a single village.

Owing to the popularity of the Institute's seed, it has been possible to take the first step towards establishing a block of pure Malvi cotton in the neighbourhood of the Institute.

(*b*) *Influence of self-fertilisation on vigour.*—The experiment carried out on this problem in the year under review proved inconclusive, and further enquiry has been postponed pending the propagation of material more suitable for the test. It can be said with confidence, however, that if there is any inter-line hybrid vigour in cotton, it is so small as to be of no practical importance.

(*c*) *Cotton for irrigated and manured land in Malwa.*—Owing to the extreme difficulty of growing a satisfactory crop of New World cotton at the Institute, progress with Cambodia has been slower than with Malvi. While the selected strains Indore 1 and Indore 25 are undoubtedly superior in quality and uniformity, there is no evidence that they are any better in yield than Dhar bulk Cambodia. Arrangements have been made to carry on work on American cottons in more suitable localities, and fresh selections have been made from Dhar Cambodia Malan and from a Bourbon cotton grown by a private individual last year.

The results reported last year from trials involving a comparison of Malvi and Cambodia cotton on irrigated land cast considerable doubt upon the supposed superiority of Cambodia cotton under such conditions.

As the problem of the maintenance of pure seed in Malwa would be greatly simplified if there were only one type to be maintained, it became of importance to obtain reliable data on the relative return to the cultivator of Malvi and Cambodia cotton under irrigated as well as *barani* conditions. As a preliminary, samples of *desi* cotton and American cotton were picked separately in fields where they were growing as mixtures, and samples of the pure lints together with samples of the mixtures were submitted to spinners and to the Technological Laboratory, Matunga, for valuation. The opinions expressed on the relative values of the samples differed very widely. Experiments have been laid down at four centres in Malwa, in each case on *adhan* and on *barani* land, to provide accurate data on the relative yields of American and *desi* cottons and to provide lint for spinning tests on strictly comparable material, so that reliable data shall be available concerning gross return per acre from the two types.

(*d*) *In Rajputana*, work on cotton in the Gang Canal Colony of Bikaner State continues to make good progress under the special scheme financed by the Indian Central Cotton Committee, the scientific control of which is entrusted to the Institute.

Mollisoni is now definitely recommended as the safest variety of cotton at present. Cwn. 520 has continued to do as well as Mollisoni, and this year experiments have been laid down to give at the same time further information on the behaviour of this variety under Gang Canal conditions and to bulk it up for distribution if desired next year.

Selections were made last season in the Ganganagar farm bulk Mollisoni and in an American strain from the Punjab known as TT Okara.

Observations made during the year on growth and shedding under Ganganagar conditions have led to the conclusion that most existing varieties have not the most advantageous vegetative structure for Ganganagar conditions, and with a view to making selections of types of desirable morphology, plots of unselected Sind *desi* and Punjab *desi* are being grown this year.

Studies in cotton agronomy and nutrition have been continued.

(1) *Sowing date.*—The results obtained last year have been confirmed. May sowing has given the highest yield. In the case of Mollisoni sowing as late as June is possible though very late sown cotton seems to yield rather coarse lint. Pre-sowing irrigation followed by cultivation given to May and June sown crops has not given any significant superiority.

(2) *Irrigation adjustments.*—Mollisoni behaved as it did last year with no significant difference between yields when the range of irrigation varied from 3 to 10. Minimum number of irrigations at all stages of growth induced earlier flush. P. 289 F which responded to 11 and 13 irrigations last year showed no significant differences in yield when the number was varied from 6 to 11. This indicates that it is the distribution of irrigation according to the physiological needs of the crop which matters and not the number of irrigations. The favourable influence of liberal irrigation during the flowering stage and to a certain extent during the early seedling stage, and also the detrimental effect of post-September irrigations have been qualitatively indicated by these experiments. Further experiments on irrigation systems are only likely to be of value if carried out as part of a programme of investigation in cotton physiology.

(3) *Green manuring and cotton.*—Sann (*Crotalaria juncea*) or Guara (*Cyamopsis sp.*) ploughed in is clearly superior to fallow in its effect on the subsequent toria (*Brassica Napus*) and cotton crops. When the green crop is cut at flowering stage and removed, however, cotton after sann is found to fluctuate widely in yield as compared with the

steady yields of cotton after guara. This may be ascribed to a greater fluctuation in the stand of the surface rooted sann under Ganganagar soil conditions than the guara crop, leading to uneven distribution of organic matter left behind by the stubble.

(*e*) In view of the importance of the cotton crop in the Nimar tract, considerable attention was paid to it during the year.

In variety trials, Banilla failed to maintain the promise of the previous year, and it is fairly evident that of existing varieties, roseum strains from either the C. P. or Khandesh will give the highest return to the cultivator. Such strains have been introduced in a part of the tract in the past by the Agricultural Department of Dhar State and the Institute's cotton census (see below) revealed the fact that Nimar cultivators can, and in many cases do, maintain their stocks of roseum seed in a state of reasonable purity over a period of years.

An inquiry into the history of cotton in Central India conducted in connection with the cotton census revealed the fact that the Nimar tract at one time produced a fine cotton. In view of this fact, and of the probable future requirements of the Indian market, it was decided that a systematic attempt should be made to obtain a cotton suitable for the Nimar tract of considerably better quality than the roseum strains available, or the roseum mixture at present grown.

Two lines of selection were initiated: (1) in *desi* cotton, and (2) in an acclimatised American cotton occurring as a mixture and known as Malan. These selections will be grown during the coming year in replicated and randomised progeny rows at a suitable centre in the Nimar tract.

(*f*) The botanical survey of cottons grown in India has been modified in the light of experience, and in view of the fact that a considerable body of evidence accumulated in Trinidad is now available to supplement that obtained at the Institute. An arrangement has been made whereby the botanical classification of Indian cottons will be carried out in collaboration with the Curator of the Herbarium, Royal Botanic Gardens, Calcutta. The cotton herbarium in the Royal Botanic Gardens will be examined at the Institute and it is hoped that the comparison of living plants with an extensive range of herbarium material will enable a classification to be made which will be satisfactory both to the botanist and to the agriculturist. At the same time, the study of the genetics of cotton is now sufficiently well advanced for the requirements of genetic principles also to be adequately met.

A clear distinction should be made between a botanical classification, which serves as a framework within which more detailed classifications must fit, and the detailed classification desired by the agriculturalist for convenience in cataloguing his commercial strains. It is to confusion between these two that the present unsatisfactory state of the taxonomy of Gossypium must be ascribed. When the botanical classification has been dealt with, it is proposed to discuss the requirements and possibilities of an agricultural classification in a separate paper.

During the 1933 cotton season an extensive census was carried out on the cotton crops of Malwa and Nimar. This was done with two objects in view. In the first place, it was desired to obtain data which would render possible a satisfactory test of the theory that Malvi cotton has deteriorated as a result of mixture with roseum from Nimar. In the second place information was required on the botanical and genetic constitution of the commercial crop before the introduction of pure, improved strains.

Results of great interest and importance were obtained, and are now being written up. In general it may be said that there is no evidence of recent invasion of Malwa by roseum cottons. Easy transport facilities have existed for a very long period between Malwa and Nimar and it is most probable that the present botanical equilibrium is of long standing. There is a record of the occurrence of plants of the roseum type in high quality Malvi cotton as far back as 1843. There is a sharp line of demarcation formed by the

Vindhya range between Malvi and Nimari cottons. Below the Ghats the ratio between Malvi and roseum types is 2 to 7 while above the Ghats it is 6 to 1. In the Ghats the ratio is intermediate.

The most striking observation which emerged from the census was that in Malwa over 60 per cent. of all cotton plants are American types of the species *G. Hirsutum*. These are usually, but erroneously, known as Cambodia. Some Cambodia seed was introduced into Malwa by the late Mr. Bernard Coventry, C.I.E., but he himself states that an American cotton known as Marwari cotton existed as a considerable component of the local mixture in Malwa at that time. An upland of rather different type known as Malan exists to the extent of about 20 per cent. in the Nimari mixture also. These cottons are no doubt relics of the introduction made under the auspices of the East India Company in the middle years of last century. It is abundantly clear that in the last fifty years the invasion of Malwa by American cotton has been out of all proportion greater than any possible invasion by roseum types.

Opinions on the spinning value of Malwa American are very conflicting. One well-known spinner described the sample shown him as of very little value. Another valued it as capable of spinning 30's, while the Director of the Technological Laboratory, in reporting on a fibre test on the same sample (Fibre Test Report No. 87), gave it as the Spinning Master's opinion that: "The Cambodia by itself would yield an even 30's/34's yarn and perhaps is thus a little too good to mix with the *Desi*." From the mean hair weight per inch data, the American component, the *desi* component and the mixture all from the same field were judged capable of spinning the following highest standard warp counts :—

Cotton	*H. S. W. C.*
American	26
Mixture	27
Desi	21

On this basis, quite clearly there should have been a very marked improvement in the spinning quality of Malvi cotton during the last few decades, as the American types spread through the crop.

Experiments have been laid down in the current season to provide further information on the yield and spinning value of Malwa American in the hope of reconciling the differences in trade opinions, and determining the probable effect of this component on the quality of Malvi cotton.

It may be remarked in passing that whereas the local mixture of Dhar State was valued on this occasion as good for a highest standard warp count of 27, similar local mixtures in spinning tests have averaged a highest standard warp count of 12 only. It is intended to collect material for submission for test by the Technological Laboratory in an attempt to investigate this discrepancy.

(*g*) The study of the effects of radiation on cotton seeds has been carried a stage further. A plant derived from an irradiated seed has been discovered in which the chromosome number is greater than the normal. Progenies are being grown with a view to discovering any recessive morphological changes which may have taken place.

(*h*) Cytological work has been carried on with hybrids between the wild *G. africanum* and cultivated Asiatic cottons, and with the progeny of a sterile plant which occurred in an inter-specific cross. In the former experiment changes in chromosome number have been observed. In the latter, considerable genetic evidence has been accumulated, but the cytological evidence is still incomplete. The work is in progress.

(*j*) The study of the genetics of lint length and ginning per cent. has been included as part of a larger investigation into the inheritance of quantitative characters. Quantitative characters are the only ones of interest to the plant breeder, and the problem

of their inheritance is one of the most pressing in modern genetics. Together with the study of quantitative inheritance, studies in methods and effects of selection have been commenced, with a view to determining the most rapid and the most efficient methods of obtaining improvement. These experiments involve detailed studies under the following heads :—

1. Development and study of statistics of the second and third degrees for the evaluation of genetic variance and of the effects of selection on the amplitude and symmetry of distributions.

2. Development of statistical methods for separating the environmental and genetic components of variance.

3. Correlation between simple characters and complex ones, and the evaluation of linkage relations of genes of small individual effect.

4. Development of methods of measuring factors influencing quality.

(*k*) Genetic studies are in progress on the following characters :—

Lintless.	Leaf shape.	Lethal factors.
Naked seed.	Lint colour.	Kidney seed.
Anthocyanin pigmentation.	Short petal.	Crumpled leaf.

Associations between most of these characters and factors for lint quality have already been demonstrated and these experiments afford the data for the study of the linkage relations of genes of small individual effect mentioned above. (1) Studies begun in Trinidad on the nature and causes of genetic instability in certain strains of cotton are being continued, and some evidence has been obtained that the rate of mutation at Indore is of the same order as it is in Trinidad.

(ii) Cotton Physiology and Agronomy.

(*a*) *Leaf-roll and Red-leaf of American cottons.*—It is now definitely established that the conditions produced by deflocculated soil reduce the activity of roots. This lowers the osmotic pressure of the leaf sap. The soil solution appears to become more concentrated due to deflocculation in black cotton soil. Similar soil conditions can also be obtained in naturally open sandy soils, as was observed this year at Jaipur where leaf-roll and red-leaf made their appearance. Further interesting data are expected when the plant material and soils collected are examined. A direct proof of the correctness of these findings was furnished by the successful growth of normal American cotton plants in black cotton soil when open pore space was maintained in the surface layer during the crop season. A paper on osmotic pressure relations was read before the Science Congress, 1934.

(*b*) *Biochemical Studies on Wilt.*—Root studies of healthy and wilted plants in the field indicate that mere presence of fungus in the plant tissue is not enough to cause death. The ratio of active to dead roots in the upper soil zones must become very low, below unity, before the plant succumbs. There appears to be a periodicity in the virulence of the attack which seems to differ from variety to variety. This periodicity is associated with the fluctuations in soil conditions which accompany weather changes. The resulting variations in root vigour lead to the advance of the disease by rapid steps at certain times rather than by steady invasion, and result in a succession of waves of plant mortality. The root distribution of different varieties in soil zones is not always similar and hence adverse conditions in a particular soil zone will not affect all varieties equally. This may explain the differences observed between varieties in the times at which waves of mortality occur. Obviously a plant with its roots widely distributed both horizontally and vertically is likely to suffer less from the effects of adverse environment in any single soil zone. Such a plant may prove more resistant than one with a localized concentration of roots.

It was observed that the brown discoloration of the root and stem is not always associated with the presence of fungus in the plant tissue. Such discoloration has been artificially produced in cotton plants in water cultures in the absence of fungus.

(*c*) *Factors governing the yields of cotton.*—The higher yields obtained from pre-rain-sown crops varied widely and seemed to depend mainly on the better nutrition of the seedling of the pre-sown crop. Further experiments, while confirming this, indicate that the higher yields are not due solely to the interval between two sowings. A paper, embodying these results, was read before the Indian Science Congress, 1934.

Root development under pre-sown and rain-sown conditions has been studied but the results have not yet been analysed. Sowing in dry soils without irrigation before rains has shown no significant difference over rain-sown crops in the case of *Desi* cotton. There seems to be a tendency for some American cottons to give better yields under these conditions.

(*d*) *Spacing.*—The great elasticity of the new Malvi selections is confirmed. Spacings of 24″ between rows with 8″ between plants and 12″ between rows with 3″ between plants gave no significant difference in yield.

(*e*) *Topping.*—In fertile soils with vigorous plant growth, topping before the budding stage has a favourable influence on yield. Under poor soil conditions, however, no such influence was found. Later topping had a depressing effect on yield. As a result of these findings certain changes have been made in the morphological standards adopted in selection work.

(*f*) *Soil Conditions and Yield.*—(1) *Soil Type.*—In lysimeter experiments with soils of Dhar, Jaipur and Indore carried out at Indore it has been observed that the differences in the yield of cotton both American and *desi* found in the different tracts are mainly due to the soil type and not so much to the climate.

(2) *Humus supply.*—Though differences in yields due to surface dressings of various strengths were not significant last year, very large differences in yield were obtained this year when the organic manure was mixed in the whole soil profile. Municipal compost gave better yield than both Farm Yard manure and Farm Compost indicating the importance of phosphatic nutrition to the cotton crop.

(3) *Soil Texture.*—In plots where the surface soil was kept open by dressings of lightly heated soil, similar increased yields have been obtained without manuring. It was also observed that the response to manuring is much greater in the soil so treated. It may be noted that in the experiments of 1929-31, surface dressings of super phosphate gave a decreased yield. On examining the profiles of heated soil beds, manured beds and control plots after the cotton crop was harvested, a much more open texture was observed up to about 18″ in the former two. It is possible that in garden lands, where organic manure is applied every year, the high yields may be due mainly to the open texture of the soil. Further it is found that better boll development is associated with such increased yields. A paper setting out these facts was read before the Indian Science Congress, 1934. A practical application of this finding is being devised this year which if successful will provide a cheap and simple means of increasing cotton yields in the black soils of Malwa.

(4) *Artificial manures.*—A preliminary series of pot cultures also indicated that the response of cotton to Nitrogen, Potassium and Phosphorus was profoundly modified by the secondary effect on soil texture of the other components of the ingredients used. This point is being further elaborated both in pot cultures and in fields in different tracts so that the interaction of soil texture and nutrient supply may be more clearly understood. It may then be possible to provide a rational basis for the manuring of cotton under local conditions.

(*g*) *Crop vigour and seed composition.*—Along with the differences in yield in the same variety of a crop when sown in different tracts or under different conditions in the same tract, differences in the percentage of essential components have been observed. An investigation has now been started to define the nature of this difference and its relation, if any, to the yield vigour of the plant. Groundnut seed is being taken up first for study as it is expected to show clearer differences. This will be followed by studies on cotton, linseed, wheat and barley, typical samples of which have already been collected. The study includes a comparison of the products obtained from healthy and diseased cotton plants as well as the modifying influence of different treatments.

(*h*) *Reaction changes in the sap as an index to the career of cotton crop.*—Previous work reported last year indicated that during the crop period there are periodic fluctuations in the sap reaction which frequently fall below normal. There seems to be a close connection between this periodic ill-health of the plant and its final performance. To get a preliminary idea reaction studies have been made on the plant sap as well as on the soil underneath at various stages of growth under different treatments. This work will be further extended in the hope of locating the most vital period of plant growth, at which existing conditions may determine the nature of its future behaviour. Incidentally the changes in the conditions of different zones of the soil during the crop season in a cotton field will be better understood.

(*j*) *Ripening of cotton bolls.*—The processes going on during the ripening of the bolls and the influence of environmental factors on them are being studied. This is expected to give clues to the local variations observed in the quality of the produce of varieties.

(*k*) *Other factors.*—Work in estimating the relative share of sunlight, temperature, and changes in soil atmosphere in producing the several development phases of the cotton plant observed in the field has now been started. A detailed study of the influence of soil atmosphere on healthy and diseased conditions of the cotton plant and the effect of temperature and light on yield vigour as influenced by soil and moisture has been undertaken this year.

9. *Sugar-cane and Sugar-beet.*—It is now definitely established that the growth of sugar-cane till the rains break in Malwa is insignificant and the main development of the crop takes place only in the monsoon. The crop is popular in spite of this handicap and further improvements are being worked out. Co. 290 seems to be a promising variety in Malwa, readily responding to intensive methods, while Co. 213 appears to suit hotter regions and lighter soils. Two leaflets on efficient sugar-cane cultivation and *gur*-boiling have been issued.

Sugar-beet appears to be a substitute for sugar-cane in Malwa and similar areas. It has been possible to grow sugar-beet as an extensive rain-sown crop with little or no manure and yet obtain yields and sugar contents similar to those obtained in bulk crops in Europe. Unlike sugar-cane the growing season for beet seems to be longer; the crop stands drought, waterlogging and frost and leaves the soil in deep tilth, a great advantage for the heavy soils of Malwa, where soil texture is all important in determining yield. A hand slicer has been devised and sun drying of sliced beet on a large scale offered no difficulties. A simple method for the extraction of dried beet, utilizing the extract for preparing sugar by a modified Bel process is contemplated. Extensive field trials all over Malwa and Rajputana are being carried out.

It is interesting to note that the Director of Agriculture, North-West Frontier Province, has been successful in cultivating sugar-beet over large areas. It is expected that this crop can be grown in many other parts of India with suitable adjustments. The dried sliced beets will be a valuable source of sugar during the off-season, thus removing the handicap of a short operating season, suffered by the cane sugar industry. In addition, beet tops provide succulent fodder in the dry season. Detailed study with a view to early large scale introduction of sugar-beet in Malwa and Rajputana has been undertaken.

10. *Tobacco.*—Following the successful trials of last year, a large number of varieties suited for *hukka, jarda*, bright leaf cigarette types, dark heavy leaf for pipe tobacco and cigar wrappers and binders as well as Turkish varieties were grown on a large scale during the year under report. There was no difficulty in growing any of the strains imported from the provinces or from abroad. Turkish tobacco grows well on poor lands and requires least attention. Gujerat varieties succeed very well and their curing has been modified to suit local conditions. The curing of other types also presented no difficulties. With bright leaf imported varieties, however, it was not possible to fix the colour by the modified process, as they are easily affected by weather changes. The Pusa hybrids were easily cured to bright leaf without a flue, but the imported varieties are of better quality and seem to be preferable. A modification to suit the curing of imported types is in contemplation and is expected to be a combination of the process evolved last year with a simplified barn, the latter to be used when weather conditions are unfavourable and probably during the early stages of colour fixing also. If this is successful, the main obstacle in growing cigarette tobaccos will be removed. It is interesting to note that all these tobaccos grow without any irrigation in ordinary wheat lands. Some adjustments in the system of cultivation will have to be made according to the type. The work was greatly handicapped by the wholesale destruction of the crop by frost just at the ripening stage.

Improved methods of economising seed and enabling production of high quality seed have been undertaken. Tobacco trials during the next year will be made on a commercial scale at Indore and other centres.

11. *Wheat.*—Previous results—Punjab 8A, Punjab 9D and Pusa 101 are promising types in Rajputana. In Malwa Punjab 9D followed by C.P. 115, Pusa 12 and Pusa 101 have given good yields comparable with local wheat, but the latter is locally recognized as of superior quality. Very high yields of Nimar red, C.P. 115 and P. 101 were obtained in an irrigated trial in Nimar. P. 4, P. 80-5, P. 111 and P. 114 have given poor yields wherever they were tried.

Results of 1933-34 trials with additional types from Bombay and C. P. carried out in 12 States in Central India and Rajputana are being examined.

A comparative investigation of plant development in relation to spacing in *durum* and bread wheats was carried out in the replicated variety trials at the Institute. The objects of the experiment were to determine the characters having the greatest influence on yield, in order to provide the soundest possible basis for selection, and to compare the developmental history of Indian varieties with a short-life cycle with that of European long-life cycle types. The data collected is of great interest, but the analysis is not yet complete.

Selections were made from local wheats in Malwa, Rajputana and Bundelkhand.

12. *Gram.*—Previous results—C. P. 28 in Malwa and Punjab 19 in Bikaner have shown promise. Results of new trials with several additional types carried out in 10 States are being examined.

13. *Linseed.*—Previous results—Cwn. 1206 (seed of pale yellow colour) has given yields approaching local linseed at Indore and in Bikaner. Results of trials with additional types carried out in 9 States are being examined.

14. *Barley.*—Previous results—Punjab 4 has given high yields at Jaipur and in Bikaner. It is the best quality barley at present on the market. New trials were carried out at several centres in Rajputana and the results are being examined. Selections were made from the local bulk in Jaipur, Alwar and Datia.

15. *Jowar.*—Variety trials have been suspended and mass selection work on local *jowar* wherever it is grown has been started.

16. *Lucerne.*—Seed imported from Nasik has proved to be the best. As the growth of lucerne is still not sufficiently vigorous further agronomic adjustments are necessary. Growing on low ridges with indirect watering along furrows seems to give better results. Mixed or associated growth of Sudan grass and Lucerne is being tested in a replicated experiment. A leaflet has been published.

17. *Groundnuts.*—Previous results—Gangapuri has given good yields in several trials. At Datia a very high yield of Akola 10 was obtained. New trials with additional American and African types have been laid out in several States.

An attempt to reduce the cost of shelling groundnut seed by sowing whole nuts, slightly cracked or soaked, if necessary, was made during the last two years. Cracked but unsoaked nuts seem to germinate satisfactorily.

18. *Soya beans.*—Punjab white, a promising *desi* type, is being grown in small plots in several States in the coming *kharif* season.

All the American varieties imported grew satisfactorily at Indore. Their oil content was fairly high and edibility better than *desi* varieties. The seed is being multiplied for large-scale trials before a final choice of variety. The usefulness of the crop as a good fodder and oil seed is still very little known. By production in large quantities in a few centres and growing as a sub-crop in other areas it is hoped to advertise its utility.

19. *Rice.*—Twenty varieties from Punjab, U. P., Bihar, Bengal and C. P. were tried in garden land as well as in a water-logged field. About nine early varieties have stood out in the test, most of them giving a high quality rice. As this crop is intended to be introduced in *Adhan* lands and as a profitable market exists only for high quality, future work in rice is restricted only to such high class and early varieties. Several modifications in the cropping system are under trial at Indore to increase yield and induce earliness. The most promising varieties have been distributed at several centres in Malwa for trial.

In the water-logged fields only a few varieties reached ripening stage. This point will be investigated in detail during the ensuing year.

20. *Fibre Crops.*—Sann (*Crotalaria Juncea*), Patwa (*Hibiscus cannabinus*) and New Patwa (*Hibiscus subdariffa*) were compared. A selection of Sann known as Cawn. 12 was tested. So far Sann seems to do best at Indore while at Jodhpur, both patwas were successful. Further large scale trials are in progress.

21. *Other Crops.*—Early types of *tur*, such as Malvi and Nimari are being tested in Rajputana.

Improved Punjab, Pusa and Australian varieties of oats were tried in Bharatpur, Jaipur, Jodhpur and Rewa. Improved Toria, Taramira and Sarson from the Punjab were tried in Rajputana and Bundelkhand. Small experiments were carried out with maize, sesamum, castor, pulses, potatoes and clovers and selections were made from local crops of sesamum.

22. *General Agronomy.*—(*a*) *Nitrification in black soils.*—These studies have been carried out in black cotton soils, Jaipur soils and other soil types with and without manure under summer and rainy conditions, in cropped and uncropped areas and in fertile and poor patches. The various factors operating have been subjected to comparative assay and the bearing of the findings on crop growth is being estimated. Two papers are ready for publication.

(*b*) *General Soil Studies.*—Surface and sub-soil samples from various localities as well as profile samples from typical tracts are being accumulated with a view to obtaining definite information about the relation between the soil properties and cropping vigour. The differences in the soil depth as regards the mechanical and chemical composition,

available nutrients, physical texture, reaction, base exchange and organic matter status will give a definite idea of the normal course of soil behaviour in each tract and is expected to provide a rational basis for determining the nature and practical limits of adjustments calculated to lead to improved soil management. More lysimeters are being constructed for a closer study of the more important soil types on the same model as those of last year, which have proved very useful. Thus a preliminary study of the difficulties of cotton growing experienced during the past season in certain tracts can now be made at Indore in close contact with laboratory work.

(*c*) *Crop growth in poor patches.*—After preliminary observation during the last few years definite data have now been accumulated in the case of the wheat crop and a detailed study on cotton, *jowar*, groundnut and wheat has been undertaken this year. It is expected that the progressive effect of soil texture and moisture movements during the season on the final performance of field crops will be elucidated.

(*d*) *Water-logged soils.*—Adjustments by methods of cultivation having failed during the last season attempts are being made to increase the productive capacity of water-logged soils by the introduction of suitable crops and application of chemicals. Similar work has been started at Bharatpur to ameliorate alkali and saline lands. It appears, however, that the problem differs only in degree from that of poor patches in ordinary fields.

(*e*) *Erosion of black cotton soil.*—The severity of losses of fertility due to erosion having been established the importance of reducing them and of maintaining the fertility of the land is as great as that of providing an adequate supply of humus. The main lines of improvement based on the experience of last year are the use of low spreading crops as contour strip barriers across fields and the planting of low spreading hardy bushes on field margins to retard the rush of sheets of water from outside. Special modifications have to be made to reduce *gully* erosion. It is expected that a practical method on these lines will be more within the reach of local cultivators than other more elaborate and more costly methods. The progress of this work is bound to be slow but the earlier it is started the better. Wind erosion in the sandy areas of Rajputana is also being kept in view.

(*f*) *Interculture of crops.*—The relative importance of weeding, shallow and deep interculture was tested on cotton, *jowar* and groundnut. The results indicate that the greatest benefit is derived from weeding. Shallow interculture is better than deep probably because the latter leads to greater moisture losses at the ripening stage. Deep intercultivation, however, in the early wet months is sometimes beneficial. A method of interculture having the advantages of both shallow and deep is in contemplation. Replicated tests for comparing different systems of intercultivation and rotation are being continued.

(*g*) *Associated growths of crops.*—Sub-cropping *jowar*, groundnut and *tur* with Soybeans, cowpeas and black gram was tested in replicated experiments. At the present row spacing (14″) the sub-crop tends to depress the yields of the main crop. If the main crop can be profitably sown at a greater row distance, it may perhaps be possible to intersow a suitable dwarf non-spreading early variety of Soybeans. This possibility is being investigated.

(*h*) *Kans eradication.*—Sodium chlorate has been found much more effective than sodium arsenite but it leaves a certain amount of toxicity behind and a *rabi* crop cannot follow immediately. Adjustments to correct this defect and also the possible use of other chemicals is being investigated. A comparative study as regards simplicity and cheapness of chemical methods as against eradication with heavy implements is being made. A revised leaflet on the method of eradication by kans plough has been issued.

(*i*) *Control of white ants.*—The arsenic bran bait is successful wherever soil moisture conditions are favourable, but in the dry conditions of sandy areas the results have been irregular. Improvements in the method of applications as well as the use of other materials have been undertaken.

(*j*) *Miscellaneous.*—A variety of plants and shrubs are under preliminary observation, as regards their utility as fodder, cover, green manures, erosion barriers, suitability for saline lands, etc. The usefulness of cowpea as a cover before the *rabi* crop has been confirmed. Safflower has been grown successfully in Jodhpur with irrigation. Its performance as a dry crop is to be tested.

An agronomical survey to collect together local information about crop environment, systems of cultivation, costs of production and local demand has been started. A questionnaire is being circulated and arrangements have been made for growing several crops in different localities and recording the required costings data.

23. *Pasture survey and manuring.*—A comparison of feeding values and yield as well as the proportion of edible and non-edible varieties in rich and poor natural pastures has been made. Rich grass areas not only give three times as much bulk of fodder but also contain fewer of the non-edible weeds which predominate in poor grass land. Application of ammonium sulphate seems to bring poor grass land to the level of rich grass land. Superphosphate has little or no effect.

24. *Silage.*—A simple and cheap means of making silage in mud-walled towers from uncut green material including green grass has been devised. A leaflet has been issued and a paper sent for publication.

25. *Compost manufacture*—(*a*) *Farm Refuse.*—Several modifications of the standard process have been devised to suit canal-irrigated and rain-fed areas. A bulletin (No. 2, 1934) and two leaflets have been published.

A modification for composting dung alone is under way. This will suit conditions where other materials are scarce. Similar adjustments for composting cane-trash in bulk are in progress.

(*b*) *Phosphatic Composts.*—The work on composting of habitation wastes was completed with the publication of a bulletin (No. 1, 1934).

Lightly charred bones crushed in a mortar mill have been used in the preparation of compost with rain water. It has been possible to produce composts containing P_2O_5 equal to that of pudrette and municipal compost. Work on the preparation of other synthetic composts with high proportions of available plant foods is in progress.

26. *Experimental Technique.*—Data obtained from the uniformity trial carried out on cotton in 1933 are being examined together with information from scattered plot experiments, and the statistical results of standard trials.

The following information has been obtained from a preliminary examination of the material :—

(*a*) An estimate of the effect of discarding outskirts on the accuracy of experiments with different plot sizes.

(*b*) An estimate of the value of data obtained by sampling small plots in replicated experiments.

(*c*) Determination of the optimum number of samples necessary for halo length determination in cotton.

An attempt is being made to devise a simpler technique for variety trials in outstations which will at the same time provide the accurate information at present obtained from compact replicated experiments. Results from scattered plots in 1933 are encouraging.

27. *Publications.*—(1) " The Sanitary Disposal and Agricultural Utilization of Habitation Wastes by the Indore Process " by F. K. Jackson and Y. D. Wad in *The Indian Medical Gazette* and reprinted as Institute Bulletin No. 1.

(2) " The Supply of Humus to Soils " by F. K. Jackson, Y. D. Wad and V. G. Panse in the *Empire Cotton Growing Review* and reprinted as Institute Bulletin No. 2.

(3) " Nitrogen Balance in Black Cotton Soils " in the Malwa Plateau I by Y.D. Wad and V. G. Panse, *Indian Journal of Agricultural Science,* October 1933.

Institute Leaflets :—

No. 3 " Compost manure from Farm Wastes in Canal Irrigated Areas."

No. 4. " Cultivation of Sugar-cane (on lands not subject to white-ant attack)."

No. 6. " Silage making in mud-walled towers."

The following papers were read at the January 1934 session of the Indian Science Congress at Bombay under :—

The Genetics of Cotton by J. B. Hutchinson.

Studies in Cotton in Central India and Rajputana.

(1) " The Influence of manures and the surface texture of black cotton soil upon yields " by Y. D. Wad, S. B. Mogre and V. N. Bhargave.

(2) " Varietal reaction to date of sowing " by Kubersingh and Y. D. Wad.

(3) " Osmotic pressure relations between soil solutes and Cambodia Leaf-Sap " by Y. D. Wad and S. B. Mogre.

28. *The Working of the Farm.*—The monsoon started on the 18th June 1933 and the sowing commenced on the 19th after 3½ inches of rain had fallen. The total rainfall amounted to 50.8 inches. Rainfall decreased from 24th June onwards until 28th after which there was a long break until the 13th July. The latter part of July and the whole of August was a period of heavy rainfall when there was scarcely a rainless day. After a fortnight's break the rain started again on the 14th of September and continued for a week. There was practically no rain in October, except for a fall of 68 cents on the 19th.

29. *Crops.*—The main *kharif* crops were cotton, *jowar*, groundnut, *tur*, sann and cowpea; while the *rabi* crops were wheat, gram, tobacco and beet. Sugar-cane and lucerne were the main irrigated crops.

(*a*) *Cotton.*—The area under cotton was 62.75 acres yielding 115 maunds 28 seers of seed cotton. This gives an average of 148 lbs. per acre of seed cotton for the whole farm, the highest yield being 380 lbs. and the lowest 43 lbs. per acre.

Grouped in the order of their produce the cotton fields stand as under :—

	Field No.	Yield in lbs. per acre.	
Group I	9	380	Above 246 lbs. 3 mds.
	11	289	
	39	262	
	3	256	
Group II	1	192	Above 164 lbs. 2 mds.
	4	184	
	43	178	
	40	158	

Field No.		Yield in mds. per acre.	
Group III ..	44	143	
	7c	121	
	7a	119	
	17	88	Below 164 lbs. 2 mds.
	19	71	
	7b	69	
	5	64	
	16	43	

The heavy and continuous rainfall gave a serious set-back to the crop in its earlier stages, while the frost in January affected the yield of the final picking. It is interesting to note that rich fields like 7*a*, 7*b*, 7*c*, 43 and 44 gave markedly low yields and the comparatively poor fields stood in the first group.

(*b*) *Jowar.*—The total area under fodder *jowar* was 25.66 acres which yielded 582 maunds giving an average of 22 maunds 40 seers per acre. The per acre produce from the individual fields was as under :—

Field No.	Yield in mds. per acre.		
23	56	9	0
22	23	20	0
21	12	26	0
34	11	16	0
8	9	12	0
28	4	26	0

The *jowar* was grown mixed with cowpeas in various proportions. The cowpea was suppressed totally and the above figures represent yield of *jowar* alone. The effect of heavy rainfall is clearly indicated by the low yields. The first field in the above list is a fairly rich field while the remaining except 22 are water-logged more or less. The yield varied directly according to the drainage of the field.

Jowar for grain (local variety) was grown on 7 acres yielding 35 mds. 30 srs. which s about 5 maunds to the acre.

Field No.	Yield in mds. per acre.		
42	9	0	0
45	5	0	0
15	5	10	0

The crop in field 15 was attacked by smut while that in field 45 was damaged by erosion.

Varieties of *jowar* were grown, Ramkel giving the highest yield.

(*c*) *Tur.*—Nine acres of *tur* yielded 57-28-0 or an average of 6-16-0 per acre. Arranged in order of their yields, the fields stand as under :—

Field No.	Yield in mds. per acre.		
15	8	30	0
3	7	30	0
41	5	17	0
30	4	10	0

In this case too the yields are affected more by drainage than by fertility (compare cotton).

Varieties of *tur* were grown, but they suffered heavily from frost.

(*d*) *Sann.*—This was grown for composting and for seed. The total area under sann for compost was 11½ acres, which yielded 247 maunds of green material when cut at flowering stage.

The crop for seed yielded 10 mds. 27 srs. of *clean* seed from an area of 10 acres. The field was badly infested with a creeping weed known as Pevashi. The seed of this was heavily mixed with sann—nearly 7½ maunds of weed seed was separated and burnt.

The stalks were used for compost.

(*e*) *Groundnuts.*—Akola 10, Spanish peanuts, Gangapuri and Malvi were grown. The per acre yields were as under :—

Akola 10	4½ mds.
Spanish peanut	5 „
Gangapuri..	12 „
Malvi	4¾ „

The last two are late and spreading varieties. Low yield of Spanish peanut was due to the poverty of the field. In the case of Akola 10, the sowing was delayed and was followed by a break in the rains. Much damage to the seed was done by pests. The germination was very poor. Gangapuri and Malvi were grown on a very small scale.

(*f*) *Soybeans.*—These were grown on a small scale and in association with cotton, *tur* and groundnuts.

(*g*) *Wheat.*—The total area under wheat was about 51 acres and the yield irrespective of variety, for the whole farm area was 233 maunds or 4 mds. 20 srs. per acre, the highest being 8 mds. 28 srs. and the lowest 3 mds. 20 srs. per acre. Fields can be grouped according to their yields as under :—

Field No.	Yields in mds. per acre.
42	8 28 0
30	6 20 0
1	6 6 0
5	5 3 0
15	5 0 0
27	5 0 0
2	4 4 0
16	4 0 0
3	3 27 0
18	3 20 0

Water-logged fields gave better yields than well-drained fields of moderate depth.

Bansi varieties from Nasik were tried both dry and irrigated. Type 168 is early maturing but its earliness was against it as it is subject to attack by pests. All Bansi varieties ripened earlier than the local Malvi but in yield Malvi stood first.

(*h*) *Gram.*—In fields where the cotton was suppressed by heavy rains gram was sown between the cotton lines. Some of it was sold green and some was fed to the farm bullocks. Total area under this crop was 30 acres.

The crop left for grain yielded 3½ maunds to the acre. The low yield was due to frost. Of the varieties grown C. P. 28 and Malvi were early and less attacked by frost. Pusa and Punjab varieties were late and were damaged heavily by frost. The yields have not yet been examined.

(*i*) *Linseed.*—E. B. 3 and local Malvi were early. They were less affected by frost as compared with Cawnpore varieties. Cawnpore 1193 was earlier than the others. Among the Pusa types and hybrids, Type 11 was the earliest and suffered the least from frost.

The yields have not yet been compared statistically.

(*j*) *Sugar-cane.*—Suitable land not being available, sugar-cane was grown in shallow *barani* land. The crop was poor and disappointing.

(*k*) *Tobacco.*—All varieties grew well in various fields, irrespective of fertility or irrigation. The crop was excellent but it was destroyed by frost. The dead plants were cut close to the ground immediately, and ratoon growth was obtained.

(*l*) *Sugar-beet.*—Two acres of this were grown. The crop was excellent.

30. *Silage.*—Green grass and fodder *jowar* were used for making silage, partly in mud towers and partly in pits. 858 maunds of good silage were obtained. That silage can be successfully made in *kutcha* towers is now confirmed.

31. *Compost.*—500 cartloads of compost were made from farm waste by the standard Indore method and the rain-watered processes.

The composting of habitation wastes from the residential block is in progress.

32. *Returns.*—The calculated gross returns of the farm amount to Rs. 7,000. The frost affected the returns considerably.

33. *Live Stock.*—Now that the work of permanent land improvement is finished the number of bullocks has been reduced from 22 to 14 pairs without in any way affecting the work of the farm. 240 acres of land are under cultivation.

34. *Workshop.*—The workshop is now well equipped and most of the work for the laboratories was done by the *mistry* in addition to his work for the farm. Simple laboratory appliances and small machines were made to satisfaction without outside assistance. Considerable quantities of furniture and laboratory equipment were made during the year in an economical manner. Manufacture and repair of farm implements was also carried out. The gin house was also maintained by the *mistry* and cotton from multiplication plots was ginned in addition to the farm bulk cotton.

35. *Supply of seed and implements.*—From the trading stock a number of implements such as bakhars, ridgers, and seed drills, and tools such as drag rakes, and digging forks were sold.

There was a great demand for cotton seed and groundnuts. The stocks available were quite inadequate.

36. *Maintenance and Improvement.*—Some of the farm area is being washed and eroded by the *nullah* on the north side. Measures are being taken to remedy this evil. One unused well was repaired and deepened and an area of 3 acres commanded by it brought under irrigation.

37. *Experimental Work.*—The total number of experiments carried out during the year was 36 out of which 26 were *kharif* and 10 were *rabi.*

(*a*) *Kharif crop.*—8 permanent experiments are in progress on Rotation, Interculture of *jowar* and cotton, Winter cultivation, Soil erosion, Pasture studies, Kans eradication and the incorporation of organic matter in the soil.

Of the remaining 18, eight dealt with the association of crops, four are varietal and two are manurial.

(*b*) *Rabi.*—Seven were varietal trials and the rest were agronomical.

There were small growth trials of oats, barley, bagilla, berseem, okra and linseed.

In garden crops there were manurial, agronomical and varietal trials on lucerne and sugar-cane.

PROPAGANDA AND EXTENSION WORK IN STATES.

38. *Visits to States.*—During the year under report, the Agricultural Adviser made twenty-four visits to States, the Extension Officer made thirty-four, the Geneticist and Botanist six, the Chemist and Agronomist one, and other officers nine.

39. *Instructional and training facilities.*—Agricultural training was given to agricultural and revenue officers from eight States, students nominated by three States and cultivators sent by one State. In addition, two States sent agricultural officers and cultivators for special training in tobacco work.

With the co-operation of the Indore City and Residency Area Municipal authorities, training in the method of making compost from habitation wastes was given to municipal officers and staff from seven member States, Secunderabad Cantonment authorities and officials of the Ajmer jail.

Assistance was given by the Extension Officer and members of the farm staff in organizing demonstration and propaganda work at Agricultural Shows and Cattle Fairs in seven States: Indore, Datia, Narsingarh, Orchha, Jhalawar, Tonk and Bharatpur. Exhibits illustrating the advantages of pure seeds and improved methods were shown and demonstrations given of simple implements, of compost making and silage making in *kutcha* towers. Cinematograph films of agricultural subjects were also shown, the films being provided free of charge by the Indian Central Cotton Committee and the Central Railway Publicity Board.

In the course of his tours the Extension Officer gave demonstrations and lectures to gatherings of cultivators in villages, encouraging the use of good seed, initiating the making of compost and silage, and advising on all matters of crop improvement. The students of a mission seminary in Indore visited the farm, and methods of improving agricultural practice were demonstrated to them. A cinema demonstration and lecture was given to them in the seminary by the Extension Officer.

CONCLUSION.

That the value of the Institute's work for the agriculture of Central India and Rajputana is known and appreciated is shown by the interest of member-States and the enquiries from non-members. The policy, initiated two years ago, of organizing field trials on modern lines on State farms and on the lands of enlightened cultivators is already yielding results, and the range of subjects on which the Institute is in a position to offer advice to member-States is rapidly extending.

That the research work of the Institute is also known and appreciated is shown by the large and increasing volume of research correspondence received and by the extent of the demand for exchange of the Institute publications. This is particularly satisfactory since the results of research work are only slowly realized.

J. B. HUTCHINSON,
Officiating Director.

STAFF AND RESEARCH STUDENTS OF THE INSTITUTE OF PLANT INDUSTRY ON JUNE 30TH, 1934.

Administrative and Clerical :—

Director and Agricultural Adviser to States in Central India and Rajputana	F. Keith Jackson, N.D.A. (Hons.), Dip. Ag. (Cantab.).
Personal Assistant	A. N. Srivastava, M.Sc.
Head Clerk and Accountant ..	G. M. Nadkarni.
2nd Clerk	Mohiuddin Khan.
3rd Clerk	D. D. Smith.
4th Clerk	S. M. Ajmi.
Artist	S. R. Srinivasan Ayyer.
Assistant Artist	S. Joseph.
Librarian	Bashir Husain Khan.
Experimental Record Clerk ..	S. A. Khargonekar.

Botanical :—

Geneticist and Botanist	J. B. Hutchinson, M.A. (Cantab.) (Offg. Director in leave vacancy from March to September 1934.)
Senior Botanical Assistant ..	Vacant.
Plant Breeding Assistant ..	Kubersingh, B.Ag.
Botanical Assistant	R. L. M. Ghose, M.Sc.
Statistical Assistant	V. G. Panse, B.Sc.
Genetical Assistant	Bholanath, M.Sc.
Fieldman	E. L. Rajanna.
Research Student	G. K. Govande, M.Sc., B.Ag.*
,, ,, ...	M. A. Ansari, M.Sc.*
,, ,, ...	P. D. Gadkari, M.Sc.†
,, ,, ...	S. C. Chakravarty, M.Sc.*
,, ,, ...	Shamlal Nayar, M.Sc.‡

Chemistry and Agronomy :—

Chemist and Agronomist ..	Y. D. Wad, M.A., M.Sc., A.I.I.Sc.
Laboratory Assistant	L. N. Desai, B.Sc.
,, ,, ...	G. T. Shahane.
,, ,, ...	V. S. Dravid.
Laboratory Assistant	R. S. Gharpura, B.Sc.
Research Student	Chiranjilal Nagar, B.Sc. (on deputation to Alwar State as Agricultural Officer).
,, ,, ...	V. N. Bhargave, B.Sc.* (on deputation to Ganganagar as Cotton Assistant).
,, ,, ...	R. K. Aurangabadkar, M.Sc.*
,, ,, ...	S. C. Chakravarty, M.Sc.*
,, ,, ...	K. N. Ambegaonkar, M.Sc.*
,, ,, ...	T. Krishnamoorthy, B.Sc. (Ag.).*
,, ,, ...	I. Madhusudan Rao, M.A., M.Sc.
,, ,, ...	S. B. Mogre, M.Sc.*
,, ,, ...	B. S. Kochrekar.‡

Propaganda and Extension Work :—

Extension Officer	M. L. Saksena, L.Ag., F.I.C.S.

* Institute of Plant Industry Studentship.
† King Edward Memorial Fund Scholarship.
‡ Voluntary research worker.

Farm Executive :—

Farm Superintendent	G. C. Tambe, B.Ag.
Assistant Farm Superintendent. .	S. C. Talesara, B.Ag.
Junior Farm Assistant	G. G. Phadke, L.Ag. (on deputation to Bharatpur State as Agricultural Officer; N. S. Apte, B.Ag. acting).
" " "	K. M. Simlote, B.Ag.
" " " (under training).	Lakshman Swaroop, B.Sc. (Ag.) *
Fieldman	Nihalsingh.
"	V. R. Sathe.
"	G. M. Nigudkar.
Storekeeper	Ishri Prasad.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Research Programme 1934-35—*Genetics and Botany Section.*

Cotton.

(1) *Botanical Survey* and Census of Malva area to be completed and published.

(2) *Genetics.*—Progenies will be grown of plants grown from seed X-rayed in 1932-33, and the families to be searched for recessive mutants.

If facilities are available, pollen of R and L types will be X-rayed and used to pollinate multiple recessive plants.

Study of the inheritance of major factors in Asiatic and Indian American cottons.

Study of the inheritance of quantitative characters in Indian cottons.

Study of the rate of mutation in mutable strains.

(3) *Cytology.*—Study of the causes of sterility in mutant types and of Chromosome behaviour in *G. africanum* hybrids in the hope of obtaining pseudo-New World types with increased chromosome numbers.

(4) *Physiology.*—Study of hair characteristics and the effect of environment upon them.

Development of a series of tests for lint quality to deal with the large numbers of small samples produced by the plant breeder.

(5) *Selection and Breeding.*—Propagation of Malvi 9 for distribution.

Re-selection of Malvi 9 on morphological characters.

Study of progeny rows from 1933 new selections.

Development of work on American cottons in a more suitable locality.

(6) *Variety trials* will be continued at Indore and in the States in order to obtain information on the relative response of different varieties to seasonal influences, and to obtain further information concerning the most profitable varieties in areas other than those in which distribution of Malvi selections will be in progress.

* Nominated by Alwar State.

Other Crops.

Work on other crops will be largely confined to the selection and purification of desirable high yielding strains for the main areas served by the Institute, and fundamental research will usually be restricted to cotton. Exceptions from this rule will occur from time to time when opportunities arise of solving general problems more easily than could be done on cotton, and plant breeding material will, of course, be used to the fullest possible extent to provide data of scientific value.

Plant breeding work will be carried on on the following crops :—

Kharif :—

Jowar.
Bajra.
Tur.
Guara.
Tilli.
Niger.

Rabi :—

Wheat.
Gram.
Linseed.

A part at least of the progeny rows will be sown in States in the main areas served by the Institute.

The following pure research programmes have been commenced on crops other than cotton :—

Botanical.—Comparative developmental study of bread and durum wheats.

This is complementary to the work or analysis of yield and inheritance of quantitative characters in cotton and it is also hoped that it will show how far results obtained in England on wheats with a long growing season can be applied to Indian wheats with a very short season.

Cytological.—Investigations in chromosome numbers in gram and linseed.

These involve problems of number and kind of chromosomes which cannot be attacked in cotton.

Fodder Plants.

The botanical survey of the constituents of natural fodder at the Institute is in progress and will be continued.

Chemistry and Agronomy Section.

Cotton wilt.—Studies in factors that determine whether the plant will succumb to or resist the attack of wilt fungus.

Field, cultural and laboratory work on the cotton plant, the fungus and the soil.

Nutrition of the cotton plant.—Studies in the growth, yield and vigour of the cotton plants in relation to nutrients.

Supply as affected by the soil and atmospheric moisture and temperature; light and soil gases, the influence of the nature and condition of soil and the form in which nutrients are supplied being also taken into consideration. Field and pot cultures and laboratory work on plant sap and products.

Soil Studies.—Physical and chemical examination of typical soil profiles in the area in relation to their cropping power.

Collection of definite information about the present status of agricultural crops and practices in Central India and Rajputana to provide a basis for future adjustments.

The changes in base exchange during the crop season as modified by the soil type and soil condition. The effect of weather changes, manuring, cultivation and cropping.

The influence of base exchange condition on the nitrogen balance.

Manures.—Comparison of different composts as regards the availability of plant food.

Compost making.—Further improvements in composting cane trash, phosphatic composts and rain-watered compost for deficient areas.

Use of compost.—The most efficient method of applying composts to Malwa rain-fed soils.

Soil erosion.—The best means of reducing loss of fertility by surface wash.

Heated soils.—Their influence on crop growth, especially cotton.

Agronomy of cotton.—The possibility of profitable use of artificial manures in irrigated areas on cotton.

The influence of green manuring, interculture, inter-sown crops, previous crops and winter cultivation on cotton.

The right place of cotton in the most profitable rotation.

Tobacco.—The introduction of cigarette, pipe and cigar types in Malwa with adjustments in seed production, seedling culture, manuring, cultivation and curing.

Rice.—Suitable types for garden lands with adjusted agronomy and manuring.

Sugar beet.—Manuring and spacing adjustments, drying of produce, extraction and crude sugar making if necessary, trials with better varieties.

Potatoes.—Choice of suitable varieties, manuring and preservation of seed.

Sugar-cane.—Choice of suitable variety, adjustments in cultivation practice, irrigation and manuring.

Lucerne.—Manuring and seed production.

Preliminary small growth tests on various crops.

Improvement of pasture grasses.

Eradication of kans.

Dry cultivation and manuring adjustments in Jaipur.

Studies in *jeera* cultivation.

Manurial experiments in Ganganagar, Bikaner.

Silage.—Further adjustments in the making of mud towers.

Poison baits for white ants—further adjustments.

Improvement of implements.—

A drill for inter-sown crops.

A cultivator for cotton, tobacco and beet.

APPENDIX III.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546	611,606	565,084	491,709
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257	348,009	373,345
Bombay Presidency	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,132,645	1,116,297	1,063,549
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707	292,013	278,060
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820	273,573	277,230
Central Provinces and Berar ..	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018	111,208	112,660
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390	103,784	107,633
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681	80,854	71,939
Rest of British India	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342	31,935	35,139
Total—British India ..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,987,603	2,009,664	1,946,210
Total—Indian States ..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116
Total—India ..	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,346,396	2,360,924	2,336,326

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

——	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488	33,231
Mysore	43,571	44,320	39,619	46,590	43,326	49,293	50,596	47,168
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587	53,612
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306	49,362
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,036	111,430
Kathiawar States	46,809	52,581	57,224	64,454	20,283	18,849	18,868	26,506
Other Indian States					32,558	39,382	40,209	45,197
Pondicherry					18,350	20,257	23,170	23,610
Total ..	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

——	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.
Bombay	28,328	24,970	27,324	24,361	54,409	74,979	80,092	74,868
Madras	35,198	39,560	52,188	46,582	55,717	99,389	96,340	110,875
United Provinces	16,991	10,308	13,878	20,441	18,496	14,367	19,236	17,871
Central Provinces and Berar	40,762	20,861	6,924	16,243	15,771	20,743	17,462	18,382
Punjab	3,910	4,739	3,760	4,361	4,307	2,317	2,149	..
Total ..	125,189	100,438	104,074	111,988	148,700	211,795	215,279	221,996

APPENDIX IV.

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS AND THE TRADE ON 31st AUGUST.

(In thousand bales of 400 lbs. each.)

Trade Descriptions of Cotton.	Trade Stocks on 31st August.								Mill Stocks on 31st August.		Total Indian Trade and Mill Stocks on 31st Aug.	
	Bombay		Karachi		Rest of India		Total India		Total India			
	1933.	1934.	1933.	1934.	1933.	1934.	1933.	1934.	1933.	1934.	1933.	1934.
Bengals—												
United Provinces	—	—	—	—	—	(a)16	—	16	17	20	17	36
Punjab	—	—	25	64	(b) 6	(b) 8	31	72	11	10	58	82
Sind	—	—	16	51	—	—	16	51		4		55
Rajputana	—	—	2	3	—	—	2	3	12	17	14	20
Others (Unclassified)	38	90	—	—	—	—	38	90	3	3	41	93
Total	38	90	43	118	6	24	87	232	43	54	130	286
Oomras—												
Central Provinces Oomras	—	21	—	—	—	(c) 1	—	22	27	27	27	49
Berar Oomras	—	60	—	—	—	(d)15	—	75	11	16	11	91
Khandesh—Banilla	—	—	—	—	—	—	—	—	—	6	—	6
Khandesh Oomras	40	45	—	—	—	—	40	45	17	16	57	61
Central India—Malvi	—	—	—	—	—	—	—	—	—	22	—	22
Central India—Others	—	36	—	—	—	(e) 7	—	43	33	12	33	55
Barsi and Nagar Oomras	—	26	—	—	—	(f) 1	—	27	2	7	2	34
Unclassified	99	—	—	—	—	—	99	—	—	—	99	—
Total	139	188	—	—	—	24	139	212	90	106	229	318
Verum 262	—	—	—	—	—	—	—	—	6	10	6	10
Hyderabad Gaorani	—	1	—	—	—	(f) 27	—	28	72	67	72	95
Total	—	1	—	—	—	27	—	28	78	77	78	105
Americans—												
Punjab—289-F.	—	—	—	—	—	—	—	—	3	10	3	10
Punjab (Unspecified—4-F.)	3	7	18	34	(b) 5	(b) 6	26	47	41	60	67	107
Sind—289-F	—	—	—	2	—	—	—	2	—	5	—	7
Sind (Unspecified—4-F)	—	2	2	6	—	—	2	8	2	13	4	21
Dharwar (Gadag 1)	—	—	—	—	—	—	—	—	2	3	2	3
Dharwar (Upland—Unspecified)	8	—	—	—	—	—	8	—	3	3	11	3
Cambodia (Coimbatore No. 2)	—	—	—	—	—	—	—	—	35	55	35	55
Cambodia (Unspecified)	—	20	—	—	—	—	—	20	31	33	31	53
Total	11	29	20	42	5	6	36	77	117	182	153	259
Broach—												
Surat-Navsari (Surti)	—	6	—	—	—	—	—	6	74	56	74	62
Broach (Unspecified)	106	76	—	—	—	(g) 4	106	80	55	49	161	129
Total	106	82	—	—	—	4	106	86	129	105	235	191
Dholleras—												
Mattheo	—	28	—	—	—	—	—	28	7	2	7	30
Cutch	—	—	—	—	—	—	—	—	—	1	—	1
Wagad	—	—	—	—	—	—	—	—	—	42	—	42
Dholleras (Unspecified)	85	46	—	—	(g) 7	(g) 8	92	54	32	10	124	64
Total	85	74	—	—	7	8	92	82	39	55	131	137
Southerns—												
Kumptas (Jayawant)	—	—	—	—	—	—	—	—	13	19	13	19
Kumptas (Unspecified)	—	—	—	—	—	—	—	—	54	64	54	64
Westerns	33	56	—	—	—	—	33	56	45	50	95	125
Northerns			—	—	—	—			17	19		
Coconadas (& Warangal)	—	—	—	—	—	—	—	—	3	3	3	3
Karunganni	—	—	—	—	—	—	—	—	18	15	18	15
Tinnevellies	—	3	—	—	—	—	—	3	19	30	19	33
Salems	—	—	—	—	—	—	—	—	1	3	1	3
Unclassified	55	33	—	—	—	—	55	33	—	—	55	33
Total	88	92	—	—	—	—	88	92	170	203	258	295
Comillas	—	—	—	—	—	—	—	—	—	—	—	—
Burmas (Wagale & Wagyi)	—	—	—	—	—	—	—	—	2	3	2	3
Other Sorts (Unclassified)	16	6	7	1	(g) 1	(g) 1	24	8	6	4	30	12
Total Indian Cotton	483	562	70	161	19	94	572	817	674	789	1,246	1,606

(a) Stocks at Cawnpore.
(b) Stocks in the Punjab.
(c) Stocks in the Central Provinces.
(d) Stocks in Berar.
(e) Stocks in Indore and Gwalior States.
(f) Stocks in Hyderabad State.
(g) Stocks at Ahmedabad.

N.B.—Detailed statement of Mill Stocks on 31st August 1934, is attached.

STOCKS OF RAW COTTON HELD BY THE

(Compiled from Voluntary

(In thousand bales

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras North.	Madras South.	Total Madras Presidency.	United Provinces.	Central Provinces.	Berar.	Total C. P. & Berar.	Bengal.
BENGALS—												
United Provinces	4	—	—	4	—	—	—	9	—	—	—	1
Punjab	3	—	—	3	—	—	—	—	—	—	—	2
Sind	2	—	1	3	—	—	—	—	—	—	—	—
Rajputana	4	—	—	4	—	—	—	—	—	—	—	—
Others	2	—	—	2	—	—	—	—	—	—	—	1
Total ..	15	—	1	16	—	—	—	9	—	—	—	4
OOMRAS—												
Central Provinces Oomras .	2	—	1	3	—	—	—	—	19	1	20	2
Berar Oomras	5	—	—	5	—	—	—	—	8	2	10	1
Khandesh—Banilla ..	—	—	4	4	—	—	—	—	2	—	2	—
Khandesh Oomras ..	3	—	12	15	—	—	—	—	—	—	—	—
Central India—Malvi ..	3	5	—	8	—	—	—	—	—	—	—	—
Central India—Others ..	4	1	—	5	—	—	—	4	1	—	1	—
Barsi and Nagar Oomras ..	—	—	7	7	—	—	—	—	—	—	—	—
Total ..	17	6	24	47	—	—	—	4	30	3	33	3
VERUM 262	1	—	—	1	—	—	—	—	5	2	7	—
HYDERABAD GAORANI ..	4	—	31	35	10	—	10	—	12	1	13	—
Total ..	5	—	31	36	10	—	10	—	17	3	20	—
AMERICANS—												
Punjab—289-F	2	—	1	3	—	—	—	1	—	—	—	1
Punjab (Unspecified—4-F).	8	—	—	8	—	7	7	23	—	—	—	6
Sind—289-F.	3	—	1	4	—	—	—	—	—	—	—	—
Sind (Unspecified—4-F) ..	4	—	1	5	—	8	8	—	—	—	—	—
Dharwar (Gadag 1) ..	1	—	2	3	—	—	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	2	1	—	3	—	—	—	—	—	—	—	—
Cambodia (Coimbatore No. 2)	5	2	—	7	4	41	45	—	—	1	1	2
Cambodia (Unspecified) ..	12	1	—	13	—	14	14	1	1	—	1	2
Total ..	37	4	5	46	4	70	74	25	1	1	2	11
BROACH—												
Surat-Navsari (Surti) ..	17	27	3	47	—	—	—	—	1	—	1	2
Broach (Unspecified) ..	23	18	1	42	—	2	2	—	—	—	—	—
Total ..	40	45	4	89	—	2	2	—	1	—	1	2
DHOLLERAS—												
Mattheo	1	—	—	1	—	—	—	—	—	—	—	—
Cutch	—	1	—	1	—	—	—	—	—	—	—	—
Wagad	1	31	1	33	—	—	—	—	—	—	—	—
Dholleras (Unspecified) ..	4	6	—	10	—	—	—	—	—	—	—	—
Total ..	6	38	1	45	—	—	—	—	—	—	—	—
SOUTHERNS—												
Kumptas (Jayawant) ..	6	1	7	14	3	—	3	—	—	—	—	—
Kumptas (Unspecified) ..	18	1	13	32	18	—	18	—	—	—	—	—
Westerns	12	2	16	30	3	1	4	—	—	—	—	1
Northerns	—	1	—	1	13	—	13	—	—	—	—	—
Coconadas (& Warangal) ..	—	—	1	1	—	1	1	—	—	—	—	1
Karunganni	1	1	—	2	—	12	12	—	—	—	—	1
Tinnevellies	3	—	1	4	—	26	26	—	—	—	—	—
Salems	—	—	—	—	—	3	3	—	—	—	—	—
Total ..	40	6	38	84	37	43	80	—	—	—	—	3
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi).	—	—	—	—	—	—	—	—	—	—	—	—
OTHER SORTS	4	—	—	4	—	—	—	—	—	—	—	1
Total Indian Cotton ..	164	99	104	367	51	115	166	38	49	7	56	24
AMERICANS	9	1	—	10	—	—	—	—	—	—	—	1
EGYPTIANS	3	9	1	13	1	—	1	—	1	—	1	—
EAST AFRICANS	15	20	4	39	—	—	—	1	—	—	—	3
OTHERS (Sudan, Mesopotamia, etc.)	4	—	1	5	—	—	—	—	—	—	—	—
Total Foreign Cotton ..	31	30	6	67	1	—	1	1	1	—	1	4
Grand Total ..	195	129	110	434	52	115	167	39	50	7	57	28

MILLS IN INDIA ON 31st AUGUST 1934.

Returns furnished by Mills.)

of 400 lbs. each.)

Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
													BENGALS—
3	—	17	—	—	—	2	—	—	1	—	3	20	United Provinces
5	—	10	—	—	—	—	—	—	—	—	—	10	Punjab
—	—	3	—	—	—	—	—	—	1	—	1	4	Sind
—	11	15	—	—	—	1	—	—	1	—	2	17	Rajputana
—	—	3	—	—	—	—	—	—	—	—	—	3	Others
8	11	48	—	—	—	3	—	—	3	—	6	54	Total
													OOMRAS—
—	—	25	—	1	—	—	—	—	1	—	2	27	Central Provinces Oomras
—	—	16	—	—	—	—	—	—	—	—	—	16	Berar Oomras
—	—	6	—	—	—	—	—	—	—	—	—	6	Khandesh—Banilla
—	—	15	—	—	—	—	—	—	1	—	1	16	Khandesh Oomras
—	—	8	—	—	2	5	7	—	—	—	14	22	Central India—Malvi
—	—	10	—	—	—	—	2	—	—	—	2	12	Central India—Others
—	—	7	—	—	—	—	—	—	—	—	—	7	Barsi and Nagar Oomras
—	—	87	—	1	2	5	9	—	2	—	19	106	Total
—	—	8	2	—	—	—	—	—	—	—	2	10	VERUM 262
—	—	58	9	—	—	—	—	—	—	—	9	67	HYDERABAD GAORANI
—	—	66	11	—	—	—	—	—	—	—	11	77	Total
													AMERICANS—
—	1	6	—	—	—	—	—	—	2	2	4	10	Punjab—289-F.
9	2	55	—	3	—	2	—	—	—	—	5	60	Punjab (Unspecified—4-F.)
—	—	4	—	—	—	—	—	—	—	1	1	5	Sind—289-F
—	—	13	—	—	—	—	—	—	—	—	—	13	Sind (Unspecified—4-F)
—	—	3	—	—	—	—	—	—	—	—	—	3	Dharwar (Gadag 1)
—	—	3	—	—	—	—	—	—	—	—	—	3	Dharwar (Upland—Unspecified)
—	—	55	—	—	—	—	—	—	—	—	—	55	Cambodia (Coimbatore No. 2)
—	—	31	—	1	—	—	—	—	—	1	2	33	Cambodia (Unspecified)
9	3	170	—	4	—	2	—	—	2	4	12	182	Total
													BROACH—
—	—	50	—	—	1	—	1	3	—	1	6	56	Surat-Navsari (Surti)
1	—	45	—	—	2	—	—	—	—	2	4	49	Broach (Unspecified)
1	—	95	—	—	3	—	1	3	—	3	10	105	Total
													DHOLLERAS—
—	—	1	—	—	—	—	—	1	—	—	1	2	Mattheo
—	—	1	—	—	—	—	—	—	—	—	—	1	Cutch
—	—	33	—	—	2	—	1	5	1	—	9	42	Wagad
—	—	10	—	—	—	—	—	—	—	—	—	10	Dholleras (Unspecified)
—	—	45	—	—	2	—	1	6	1	—	10	55	Total
													SOUTHERNS—
—	—	17	—	1	1	—	—	—	—	—	2	19	Kumptas (Jayawant)
—	—	50	—	11	—	—	—	—	1	2	14	64	Kumptas (Unspecified)
—	—	35	—	14	1	—	—	—	—	—	15	50	Westerns
—	—	14	—	4	—	—	—	—	—	1	5	19	Northerns
—	—	3	—	—	—	—	—	—	—	—	—	3	Coconadas (& Warangal
—	—	15	—	—	—	—	—	—	—	—	—	15	Karunganni
—	—	30	—	—	—	—	—	—	—	—	—	30	Tinnevellies
—	—	3	—	—	—	—	—	—	—	—	—	3	Salems
—	—	167	—	30	2	—	—	—	1	3	36	203	Total
—	—	—	—	—	—	—	—	—	—	—	—	—	COMILLAS
—	2	3	—	—	—	—	—	—	—	—	—	3	BURMAS (Wagale & Wagyi)
—	—	4	—	—	—	—	—	—	—	—	—	4	OTHER SORTS
18	16	685	11	35	9	10	11	9	9	10	104	789	Total Indian Cotton
—	—	11	—	—	—	—	—	—	—	—	—	11	AMERICANS
—	—	15	—	1	—	—	—	—	—	—	1	16	EGYPTIANS
2	—	45	—	—	3	—	1	1	—	—	5	50	EAST AFRICANS
—	—	5	—	2	—	—	—	—	—	—	2	7	OTHERS (Sudan, Mesopotamia, etc.)
2	—	76	—	3	3	—	1	1	—	—	8	84	Total Foreign Cotton
20	16	761	11	38	12	10	12	10	9	10	112	873	Grand Total

APPENDIX

RECEIPTS AT MILLS IN INDIA OF

(Compiled from Returns
1st *September* 1933 *to*
(In thousand bales

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Bombay Presidency.	Madras Presidency.	United Provinces.	C. P. and Berar.	Bengal.	Punjab & Delhi.	Rest of British India.
BENGALS—										
United Provinces	12	—	—	12	—	101	—	7	9	—
Punjab	8	1	1	10	—	1	—	7	21	1
Sind	4	—	1	5	—	2	—	—	—	—
Rajputana	16	—	—	16	—	1	—	—	—	21
Others	6	—	1	7	2	—	—	4	—	—
Total ..	46	1	3	50	2	105	—	18	30	22
OOMRAS—										
Central Provinces Oomras ..	10	—	1	11	—	2	44	20	—	—
Berar Oomras	18	—	—	18	—	4	21	9	—	—
Khandesh—Banilla	1	2	9	12	—	—	3	—	—	—
Khandesh Oomras	11	1	22	34	—	—	—	—	—	—
Central India—Malvi ..	10	21	—	31	—	7	—	—	—	—
Central India—Others ..	15	4	1	20	—	19	2	—	—	—
Barsi and Nagar Oomras ..	4	—	41	45	—	—	—	—	—	—
Total ..	69	28	74	171	—	32	70	29	—	—
VERUM 262	3	—	2	5	—	—	14	1	—	—
HYDERABAD GAORANI ..	22	—	41	63	7	—	21	—	—	—
Total ..	25	—	43	68	7	—	35	1	—	—
AMERICANS—										
Punjab—289-F.	5	1	1	7	—	9	—	7	1	3
Punjab (Unspecified—4-F.) ..	26	—	—	26	16	62	2	22	34	2
Sind—289-F	5	3	1	9	—	—	1	1	—	—
Sind (Unspecified—4-F) ..	10	—	2	12	18	—	—	—	—	—
Dharwar (Gadag 1)	3	—	7	10	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	5	1	1	7	2	1	—	—	—	—
Cambodia (Coimbatore No. 2)	14	4	1	19	76	—	1	5	—	—
Cambodia (Unspecified) ..	27	1	1	29	35	2	1	9	—	—
Total ..	95	10	14	119	142	74	5	44	35	5
BROACH—										
Surat-Navsari (Surti) ..	44	82	8	134	1	—	2	1	—	—
Broach (Unspecified) ..	66	53	1	120	6	—	—	1	—	2
Total ..	110	135	9	254	7	—	2	2	—	2
DHOLLERAS—										
Mattheo	10	—	—	10	—	—	—	—	—	—
Cutch	1	—	—	1	—	—	—	—	—	—
Wagad	6	103	2	116	—	—	—	—	—	—
Dholleras (Unspecified) ..	17	21	1	39	—	—	—	—	—	—
Total ..	34	129	3	166	—	—	—	—	—	—
SOUTHERNS—										
Kumptas (Jayawant) ..	12	2	10	24	2	—	—	—	—	—
Kumptas (Unspecified) ..	39	2	27	68	14	—	—	—	—	—
Westerns (Jowari and Mungari)	33	6	30	69	5	1	—	3	—	—
Northerns	1	2	—	3	13	—	—	—	—	—
Coconadas (& Warangal) ..	1	—	1	2	4	—	—	4	—	—
Karunganni	3	2	—	5	37	—	—	2	—	—
Tinnevellies	6	1	1	8	49	—	—	1	—	—
Salems	—	—	—	—	1	—	—	—	—	—
Total ..	95	15	69	179	125	1	—	10	—	—
COMILLAS	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi) ..	—	—	—	—	—	—	—	—	—	—
OTHER SORTS	6	—	—	6	1	—	—	1	—	10
Total Indian Cotton ..	480	318	215	1,013	284	212	112	105	65	39
AMERICANS	26	—	—	26	1	—	—	2	—	—
EGYPTIANS	17	30	1	48	1	—	1	2	1	—
EAST AFRICANS	49	95	12	156	1	2	2	9	2	—
OTHERS (Sudan, Mesopotamia, etc.)	10	3	1	14	1	—	—	—	—	—
Total Foreign Cotton ..	102	128	14	244	4	2	3	13	3	—
Grand Total ..	582	446	229	1,257	288	214	115	118	68	39
Indian raw cotton consumed in Indian mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act) ..	492	373	198	1,063	278	277	113	108	72	35

V.

RAW COTTON CLASSIFIED BY VARIETIES.
furnished by Mills.)
31*st August* 1934.
of 400 lbs. each.)

Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
											BENGALS—
129	—	—	—	13	—	—	2	—	15	144	United Provinces
40	—	—	—	2	—	—	1	—	3	43	Punjab
7	—	—	—	—	—	—	2	—	2	9	Sind
38	—	—	—	1	2	—	7	—	10	48	Rajputana
13	—	—	—	—	—	—	—	—	—	13	Others
227	—	—	—	16	2	—	12	—	30	257	Total
											OOMRAS—
77	—	1	—	—	—	—	4	1	6	83	Central Provinces Oomras
52	—	—	—	—	—	—	1	—	1	53	Berar Oomras
15	—	—	—	—	—	—	1	—	1	16	Khandesh—Banilla
34	—	—	—	—	—	—	—	—	—	34	Khandesh Oomras
38	—	—	13	25	42	—	6	—	86	124	Central India—Malvi
41	—	—	1	—	16	—	2	—	19	60	Central India—Others
45	—	—	—	—	—	—	—	—	—	45	Barsi and Nagar Oomras
302	—	1	14	25	58	—	14	1	113	415	Total
20	3	—	—	—	—	—	—	—	3	23	VERUM 262
91	24	—	—	—	1	—	1	—	26	117	HYDERABAD GAORANI
111	27	—	—	—	1	—	1	—	29	140	Total
											AMERICANS—
27	—	1	—	9	—	—	4	4	18	45	Punjab—289-F
164	—	3	—	—	—	—	2	—	5	169	Punjab (Unspecified—4-F)
11	—	—	—	—	—	—	—	3	3	14	Sind—289-F.
25	—	—	—	—	—	—	—	—	—	25	Sind (Unspecified—4-F).
10	—	—	1	—	—	—	—	—	1	11	Dharwar (Gadag 1)
10	—	1	—	—	—	—	—	—	1	11	Dharwar (Upland—Unspecified)
101	—	—	—	—	—	—	1	—	1	102	Cambodia (Coimbatore No. 2)
76	—	1	—	—	—	—	2	3	6	82	Cambodia (Unspecified)
424	—	6	1	9	—	—	9	10	35	459	Total
											BROACH—
138	—	—	8	—	2	8	1	3	22	160	Surat-Navsari (Surti)
129	—	—	5	—	—	—	1	3	9	138	Broach (Unspecified
267	—	—	13	—	2	8	2	6	31	298	Total
											DHOLLERAS—
10	—	—	—	—	—	7	—	—	7	17	Mattheo
1	—	—	—	—	—	—	—	—	—	1	Cutch
116	—	—	11	—	5	14	4	—	34	150	Wagad
39	—	—	1	—	—	—	—	—	1	40	Dholleras (Unspecified)
166	—	—	12	—	5	21	4	—	42	208	Total
											SOUTHERNS—
26	—	2	1	—	—	—	—	—	3	29	Kumptas (Jayawant)
82	—	14	—	—	—	—	3	—	17	99	Kumptas (Unspecified)
78	—	20	2	—	—	—	2	3	27	105	Westerns (Jowari and Mungari)
16	—	3	—	—	—	—	—	—	3	19	Northerns
10	—	—	—	—	—	—	—	3	3	13	Coconadas (& Waranga)
44	—	—	—	—	—	—	1	—	1	45	Karunganni
58	—	—	—	—	—	—	—	—	—	58	Tinnevellies
1	—	2	—	—	—	—	—	—	2	3	Salems
315	—	41	3	—	—	—	6	6	56	371	Total
—	—	—	—	—	—	—	—	—	—	—	COMILLAS
11	—	—	—	—	—	—	—	—	—	11	BURMAS (Wagale & Wagyi)
7	—	—	—	—	—	—	—	—	—	7	OTHER SORTS
1,830	27	48	43	50	68	29	48	23	336	2,166	Total Indian Cotton
29	—	—	—	—	—	—	—	1	1	30	AMERICANS
53	—	2	2	—	—	—	—	—	4	57	EGYPTIANS
172	—	1	12	—	1	4	1	—	19	191	EAST AFRICANS
15	—	4	—	—	—	—	—	—	4	19	OTHERS (Sudan, Mesopotamia, etc.)
269	—	7	14	—	1	4	1	1	28	297	Total Foreign Cotton
2,099	27	55	57	50	69	33	49	24	364	2,463	Grand Total
1,946	33	47	54	49	111	27	45	24	390	2,336	Indian raw cotton consumed in Indian mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act.)

APPENDIX VI.

EXPORTS BY SEA OF INDIAN RAW COTTON CLASSIFIED BY VARIETIES.

(Compiled from Voluntary Returns furnished by Exporters.)

1st September 1933 *to* 31*st August* 1934.

(In thousand bales of 400 lbs. each.)

Trade Descriptions of Cotton.	Exported to				Total Exports.
	Europe (excluding United Kingdom) and the West.	United Kingdom.	Japan.	China and the East (excluding Japan).	
BENGALS—					
United Provinces	7	—	7	2	16
Punjab	209	22	146	83	460
Sind	139	19	21	10	189
Rajputana	5	—	7	—	12
Others (Unclassified)	74	21	22	9	126
Total ..	434	62	203	104	803
OOMRAS— ..					
Central Provinces—Oomras ..	28	25	58	9	120
Berar—Oomras	45	7	248	13	313
Khandesh—Banilla	—	1	7	—	8
Khandesh—Oomras	66	2	167	36	271
Central India—Malvi	1	—	9	—	10
Central India—Others	20	—	104	26	150
Barsi and Nagar—Oomras ..	17	2	96	14	129
Unclassified	48	11	106	2	167
Total ..	225	48	795	100	1,168
VERUM 262	—	—	—	—	—
HYDERABAD GAORANI	3	—	—	—	3
Total ..	3	—	—	—	3
AMERICANS—					
Punjab—289-F	4	1	—	—	5
Punjab (Unspecified—4-F) ..	104	144	319	19	586
Sind—289-F	—	4	3	—	7
Sind (Unspecified—4-F.) ..	6	13	5	2	26
Dharwar (Gadag I)	—	—	—	—	—
Dharwar (Upland—Unspecified)	—	—	13	1	14
Cambodia (Coimbatore No. 2 ..	—	—	—	1	1
Cambodia (Unspecified) ..	2	3	1	—	6
Total ..	116	165	341	23	645
BROACH—					
Surat-Navsari (Surti)	1	1	—	—	2
Broach (Unspecified)	65	22	60	15	162
Total ..	66	23	60	15	164
DHOLLERAS—					
Mattheo	37	—	13	1	51
Cutch	1	—	7	—	8
Wagad	—	—	1	—	1
Dholleras (Unspecified) ..	2	—	42	7	51
Total ..	40	—	63	8	111
SOUTHERNS—					
Kumptas (Jayawant)	—	—	—	—	—
Kumptas (Unspecified) ..	1	—	—	1	2
Westerns..	31	2	21	1	55
Northerns	4	—	—	—	4
Coconadas (and Warangal) ..	19	13	—	—	32
Karunganni	7	5	3	—	15
Tinnevellies	5	11	52	4	72
Salems	—	—	—	—	—
Total ..	67	31	76	6	180
COMILLAS	24	2	—	1	27
BURMAS (Wagale and Wagyi) ..	—	—	7	8	15
OTHER SORTS	1	—	1	—	2
Grand Total ..	976	331	1,546	265	3,118
Total exports, as per official returns, from British Indian and Kathiawar Ports.	988	367	1,536	348	3,280 (including "other Countries"—41.)

APPENDIX VII.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY :—1. *Broach Tract.*—The policy of growing the improved variety of 1027 *A.L.F.* in the Surat-Broach area lying south of the river Nerbudda was continued and 886,771 lbs. of seed was distributed to cultivators in the British Districts by opening 19 Depôts financed from the subsidy granted by the Indian Central Cotton Committee, Bombay. In addition 1,660,980 lbs. of 1027 *A.L.F.* seed was supplied to the States of Rajpipla, Chhota Udepur and Baroda. The Department controlled 13,981 acres for seed multiplication in four groups of villages, of which 5,371 acres in Bardoli Taluka were managed from the funds of the Indian Central Cotton Committee.

As in last year, certain Co-operative Societies in Olpad and Chikhli Talukas have gone in for 1027 *A.L.F.* seed for distribution to their members.

2. *Khandesh Tract.*—In Khandesh the improved variety of cotton named *Banilla* is in the process of introduction and during 1933-34 its cultivation extended over about 120,000 acres representing nearly one-tenth of the total area under cotton in Khandesh. The total outturn of *Banilla* was about 30,000 bales with an average yield of 100 lbs. of lint per acre.

In the early stage, the growth of the crop was slightly retarded owing to insufficient moisture but subsequent rains improved the crop considerably. Heavy rainfall in the late stage, however, caused shedding of flowers. In some places local showers spoiled the unpicked cotton. Generally, however, the quality of the staple was satisfactory. The ginning outturn of *Banilla* ranged from 40% to 42% against 34% to 35% of local cotton. *Banilla* grown by cultivators from seed distributed by the Department fetched a premium of Rs. 10 to Rs. 12 per *candy* over local Khandesh cotton.

The seed multiplication scheme financed by the Indian Central Cotton Committee reached its third year during 1933-34 and is now in full operation. An area of 12,900 acres was sown with pure pedigree seed in the different stages under control. From this area 1,450,000 lbs. of seed was obtained.

3. *The Kumpta-Dharwar Tract.*—The work of introducing two improved varieties of cotton, viz., *Jayawant* and *Gadag No.* 1 was carried out on an extensive scale through the Hubli and Gadag Cotton Sale Societies with the aid of the funds from the Indian Central Cotton Committee. For multiplying pure pedigree seed of these two varieties, blocks of reserved areas were organized as usual. The reserved area under *Jayawant* cotton at the Hubli centre was 24,000 acres as against 15,109 of last year and that under *Gadag No.* 1 at the Gadag centre 24,620 acres as against 22,130 of the previous year. The cotton crop was below normal owing to adverse climatic conditions. The quantities of seed cotton received by the Hubli and Gadag Sale Societies from these reserved areas were 6,317 *dokras* (2,122,512 lbs.) of *Jayawant* and 4,941 *dokras* (1,660,176 lbs.) of *Gadag No.* 1 and the amounts of seed produced therefrom were 1,750,000 lbs. and 1,160,000 lbs., sufficient to cover 175,000 and 116,000 acres respectively with fresh seed during the coming season.

For distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed depôts were opened as usual in different selected centres. The general area grown with pure seed was 106,708 acres under *Jayawant* cotton and 44,800 under *Gadag No.* 1 against 53,481 acres and 31,970 acres respectively of last year and the estimated yield was 7,500 bales of *Jayawant* and 5,600 bales of *Gadag No.* 1 as against 5,567 bales and 3,200 bales respectively of last year.

Besides the above, the Hubli Society has sent about 326,445 lbs. of *Jayawant* seed, sufficient to cover an area of 32,650 acres, outside the area of operation. The total area under *Jayawant* cotton with pure seed, therefore, was 163,358 acres. The Gadag Sale Society stocked 1,206,138 lbs. of *Gadag* No. 1 cotton seed, sufficient to cover an area of 120,610 acres, and distributed only 694,222 lbs., sufficient for 69,420 acres.

With a view to spread *Jayawant* cotton in other areas, separate seed multiplication blocks of 7,156 acres at Athani (with the help of the funds from the Indian Central Cotton Committee), 847 at Bailhongal, 1,200 at Bijapur and 1,000 at Bagalkot were organized. 362,292 lbs. of seed have been purchased and stocked at the Athani centre for distribution during the next season, sufficient to cover an area of 36,229 acres.

Both *Jayawant* and *Gadag No.* 1 continued to be appreciated by the buyers who gave on an average Rs. 10 more per *naga* of seed cotton (1,344 lbs.) for *Jayawant* and Rs. 15 per *naga* for *Gadag No.* 1 in auction sales.

4. *Deccan Canals Tract.*—On the Deccan Canals the area under cotton is rapidly increasing. The average yield of lint per acre may be taken at 250 lbs. while *Banilla* cotton has given 300 lbs. of lint per acre. The area under *Banilla* cotton was about 4,000 acres which have produced 3,000 bales of lint. But most of this lint was mixed with local and N. R. cotton. Separate sale of *Banilla* cotton is necessary. In the local markets *Banilla kapas* fetched Rs. 10 to 12 more per *khandy* of 500 lbs. than local cotton. The ginning percentage of *Banilla* was 38 to 40. The Department had distributed 12,000 lbs. of pure *Banilla* seed on the canal tract.

MADRAS :—I. *The Southerns Tracts.*—(*a*) *Cambodia-Coimbatore.* (*i*) The multiplication of pure *Co.* 2 seed for distribution to cultivators continued as in previous years. During the year 1933-34, there were 954 acres (under annual contract) of seed farms with 3 societies consisting of 148 members in Tiruppur as compared to 998 acres with 4 societies and 164 members in the preceding year. The selected seed out of this (inner) area was supplied to the Tiruppur Co-operative Trading Society for sowing their annual contract area. The Tiruppur Co-operative Trading Society had 4,164 acres with 7 societies in Avanashi taluk as against 1,974½ acres with 18 societies in Avanashi and Tiruppur centres in the previous year. The total seed farm area in 1933-34 season was thus 5,118 acres.

(*ii*) Pure *Co.* 2 seed produced by the Department and the Tiruppur Co-operative Trading Society including the natural spread is estimated to have covered 47,000 acres in 1933-34 season. In addition, 31,541 lbs. of seed sufficient for about 1,250 acres was supplied to other districts in the Presidency.

(*iii*) 445 *khandies* and 333 lbs. of lint were obtained from the 1932-33 seed farms and were sold at an average premium of about Rs. 8 on the date of sale. The gradual reduction in premium is due to the high quality of lint that is being marketed owing to large natural distribution of *Co.* 2 seed.

(*iv*) During the coming season (1934-35) an area of 1,000 acres of seed farms will be under the supervision of the Agricultural Department. It is expected that the Tiruppur Co-operative Trading Society will arrange for 6,000 acres. The stock of seed with the Department (from 1933-34 seed farms) is 367,330 lbs. The Tiruppur Co-operative Trading Society has about 1,000,000 lbs. These with 14,800 lbs. of pure seed obtained by the Idigarai Agricultural Improvement Co-operative Society, Ltd., out of 100 acres of seed farms run by the Society and co-operatively ginned under the supervision of the Department will still further increase the area under this improved variety.

(*v*) *Cambodia-Trichinopoly.*—In the Trichinopoly District, 8,097 lbs. of *Co.* 2 Cambodia seed was distributed to the *ryots* by the Department during the year as against 9,075 lbs. in the 1932-33 season. The actual area under *Co.* 2 at present is 1,053 acres.

(*vi*) *Cambodia-Madura.*—The seed farm area under *Co.* 2 during the year was 123 acres as compared to 105 acres in the previous year. The amount of seed distributed by the Department during the year was 34,011 lbs. to cover an area of about 2,270 acres.

(*b*) *Karunganni-Coimbatore.*—The multiplication of *C.* 7 *Karunganni* strain of the Tinnevelly tract, which has become popular in Coimbatore with a corresponding reduction in the Uppam area, was continued. In the year under report, there were 809.87 acres of seed farm (annual contract) in Udamalpet taluk as against 830 acres in Coimbatore and

Udamalpet talukas in 1932-33 season. An amount of 101,321½ lbs. of *C.* 7 *Karunganni* seed was distributed in the year. This quantity supplemented by imports from the Koilpatti tract and stock from local *C.* 7 crops in the possession of *ryots* themselves is estimated to have occupied 16,300 acres.

The yield of lint from 1932-33 seed farms was 113 *candies* and 347 lbs. This was sold at Rs. 144 per *candy* of 510 lbs. when the market rate was about Rs. 142.

Karunganni-South.—The area under seed farms increased to 1,202 acres of both *A.* 10 and *C.* 7 strains. *A.* 10 was more in demand in the Madura Division while *C.* 7 was entirely distributed to the Tinnevelly and West Ramnad area. The total quantity of seed distributed during the year under report was 122,016 lbs. which will cover an area of 10,000 acres.

The demand is generally on the increase as the yield of improved strains was higher than that of the local ones or *Uppam* variety while the produce itself commanded a better market. With a view to meet the increasing demand for seed, the seed farm area was considerably increased.

II. *Northerns and Westerns Tract.*—(*a*) *Northerns.*—*N.* 14 is the improved strain for the locality though in point of yield it is not suited to local conditions, especially when the rainfall is light. The total area under seed farms under this strain was 60 acres as against 2,445 acres in the previous year. A total quantity of 16,080 lbs. was recovered from the seed farm *ryots*. At the beginning of the year there was a balance of 3,712 lbs. of seed. Thus a total quantity of 19,792 lbs. of seed was available for distribution, out of which 9,933 lbs. was sold and 750 lbs. was distributed to seed farm *ryots* as against a distribution of 71,861 lbs. in the previous year.

The area under *N.* 14 during the year was 3,194 acres as compared to 10,548 acres in the previous year. The reason for the decrease in area under this cotton is due to yield being very low as compared with the local *Gadag*. Further, the cultivation of groundnut at the expense of cotton is on the increase.

The average yield is estimated at 70 lbs. of *kapas* per acre. 154,977 lbs. of *kapas* was ginned under departmental supervision and 97 bales of lint were sold at a premium of Rs. 15 per *candy* of 500 lbs.

(*b*) *Westerns.*—*H.* 1 strain evolved at the Agricultural Research Station, Hagari, is the improved strain for this tract. The Government seed farms were concentrated in five villages around Guntakal, Alur and Gooty and covered in the aggregate an area of 2,895 acres as against 3,638 acres in the previous year. Besides, an area of 12,775 acres was grown under departmental seed round about Guntakal and Bellary under the *H.*1 seed extension scheme subsidised by the Indian Central Cotton Committee. A quantity of 104,681 lbs. of seed was recovered from seed farm *ryots*, 36,894 lbs. was purchased and 7,200 lbs. was transferred from Hagari, thus making a total of 201,897 lbs. available for distribution. Out of this quantity, 38,732 lbs. was issued to seed farm *ryots*. 123,300 lbs. was issued to Co-operative Societies working under the *H.* 1 seed extension scheme, and 27,734 lbs. was sold to *ryots*.

The area under this cotton is estimated to be 200,379 acres, including a natural spread of 184,709 acres. The average yield of *H.* 1 *kapas* was 200 lbs. per acre while that of the mixed local cotton was 150 lbs.

During the year 253 bales of 400 lbs. each of *H.* 1 lint were sold through the Department at a premium of Rs. 10 per bale over the local mixture, as against Rs. 6-8-0 in the previous year.

Central Provinces and Berar.—The work of the past season was in large measure concerned with the testing and multiplication of the two new strains of cotton, *Late Verum* and *V.* 434. The most conspicuous thing in these trials was the success of both

these strains and there is now a very general consensus of opinion in their favour. The seed was multiplied in places which permitted of observing their behaviour under widely divergent conditions of soil and climate and in all cases the results exceeded expectation. *Late Verum* is particularly suitable for growing in areas where the monsoon lasts till rather late in the season. It is anticipated that the area under it in the coming season will be about 16,000 acres. *V.* 434 on the other hand is specially recommended for growing in areas of short duration of the monsoon. It is a strain which possesses, in addition to wilt-resistant qualities, drought resistance, prolific flowering capacity, quickness in forming buds and setting fruit, comparative freedom from shedding and excellent lint characters and good ginning percentage. The area under it in the coming season is expected to be in the neighbourhood of some 2,000 acres.

With the multiplication of the two strains mentioned above, it is hoped, in the course of the next few years, to considerably increase, in these provinces, the proportion of medium-stapled cottons of the type in demand by Indian mills.

THE PUNJAB.—The total area under American cotton in British Districts was 809,120 acres as compared with 776,260 acres in the preceding year. Of this 4*F* was grown on 751,000 acres, whilst 289*F*—the other later selection—was reported to have been grown on 31,000 acres.

The total area under *Desi* cottons in the province (excluding Indian States) was 1,640,300 acres as against 1,113,700 acres during the preceding year. *Mollisoni*—a selection of the *indicum* variety—was grown on 728,400 acres whilst a type of improved *Roseum* covered an area of 84,100 acres.

The yield of cotton was very high throughout the province.

BURMA.—1. *Myingyan Circle.*—The total area under improved cotton was 5,576 acres, 2,938 acres being seeded with Pwinbyu strain and 2,638 acres with the reselected *C*/19 strain. The latter crop gave an average ginning outturn of 38% while the ordinary Wagale gave 32%. The total quantity of *kapas* ginned at the Mahalaing farm ginnery was 124,186 *viss* (150,474) and 73,338 *viss* (88,127) of *C*/19 seed are available for distribution.

At the Mahlaing Agricultural Station the improved *C*/19 white-flowered strain was again yield tested against three hybrid strains, viz., *LII* × *W*6, *C*19 × *W*5, and (*S* × *W*) × *W*3, one mixture of pure strains and the original Pwinbyu. Significant results have been obtained in that the two new hybrid strains *LII* × *W*6 and *C*19 × *W*5 have shown considerable promise in respect of yield and staple though in the outturn of ginned cotton *C*/19 remains superior. The mixed culture also yielded higher than *C*/19 though in the previous two years it was inferior. How long it will keep up this performance remains to be seen, and it will again be included in the next year's yield test. (*S* × *W*) × *W*3, although a cotton of definitely superior quality as is indicated by the results of spinning tests, is a shy yielder and therefore not suitable for distribution.

2. *West Central Circle.*—In the West Central Circle this crop is of importance only in Thayetmyo District where it is grown as a mixed crop with sesamum or with taung-ya paddy. Its area there was 45,000 acres.

Experiment work on cotton was confined to Allanmyo.

Hybrids.—Of the 34 crosses left at the close of the 1932-33 season, 27 were this year put out for small plot multiplication and the remaining 7 were kept under single line observation. 13 crosses made in 1932–33 were also under observation. Of the 27 crosses under multiplication it has been decided to discard 12.

Mention of the suitability of Wagale in replacement of Wagyi for the drier areas of the Circle has already been made in previous reports. Small distributions were this year made in the Minhla township of Thayetmyo District (strain D^1/E^B 625 *viss*) as well as in Minbu, Magwe and Pakokku. Yields per acre are reported to be satisfactory.

HYDERABAD STATE.—(1) *Gaorani Tract.*—Distribution of *Gaorani* seed in the protected area was continued on the same lines. 2,734,360 lbs. of seed for an area of about 171,522 acres was purchased by the Agricultural Department and distributed on *Tacavi* loan system to cultivators in the Nanded District.

(2) *Aurangabad District.*—Distribution of *Banilla* seed was continued with a view to replace the mixture now grown in the district. 49,350 lbs. of seed, sufficient for about 3,085 acres, was distributed by the Agricultural Department on *Tacavi* system.

(3) *Parbhani District.*—A beginning has been made to introduce *Verum* 262 in the Parbhani District, with the object to replace the present inferior variety. 17,734 lbs. of seed, sufficient for about 1,100 acres, was distributed by the Agricultural Department on *Tacavi* system.

(4) *Raichur District.*—Distribution of seed of improved varieties was continued with a view to replace the local inferior type of *Kumpta* and the mixed Dharwar-American. 303,924 lbs. of seed of *Jayawant* for about 16,241 acres and 42,786 lbs. of seed of *Upland Gadag No.* 1 for about 2,686 acres were purchased from the Cotton Sale Societies of Kopbal, Hubli and Gadag, and distributed on *Tacavi* system.

BARODA STATE.—*Navsari District.*—The important item during the year was the institution of a co-ordinated policy with the Bombay Department to put down the evil of *Goghari* mixture in the 1027 *A.L.F.* strain. Further, with a grant from the Indian Central Cotton Committee, controlled seed distribution scheme was put in working. A special officer for the purpose has been appointed.

2. The quantity of pedigree seed of 1027 *A.L.F.* strain distributed for the 1933–34 season was 3,420 lbs. In addition, the mass seed distribution through seed depôts amounted to 109,760 lbs. for the same season. During the present season, i.e., 1934-35 51,730 lbs. of pedigree seed for controlled area and 158,395 lbs. of seed for mass distribution were supplied through the departmental seed distribution. This should give a total area of about 17,252 acres, of which 5,342 would be in the controlled category.

3. *Baroda District.*—The Department continued to help in the voluntary extension of *Broach* 9 strain. The distribution of seed of this through the Department was 1,289 lbs. The natural spread of the strain continued through these primary growers of departmental seed. The area under this strain during 1933-34, particularly in Sinor and Savli Talukas, was over 5,000 acres. The severe frosts in January from which the cotton crop suffered extensively, is likely to give a setback to the natural spread in 1934-35, owing to lack of sufficient seed. From reports received so far, it would seem that about 4,400 acres are likely to be under *Broach* 9 during this season in Savli Taluka alone.

It may be noted that the greater part of *Broach* 9 cotton was taken up by Ahmedabad mills during 1933–34 and it is reported that a premium of Rs. 4 to 10 per *bhar* was offered by the purchasers.

4. *Mehsana District.*—The selection Wagad 8 continued to be popular. The Department supplied 6,000 lbs. of seed of this strain during the year. *Broach* 9 strain of cotton looks promising in some parts. The 1027 *A.L.F.* has been found unsuitable on account of its longer period of growth.

5. *Amreli District.*—During the year, for the extension of *Dhulia No.* 1 strain to replace the local Mathio, 15,000 lbs. of seed were distributed through the departmental farm and Seed Growers' Association at Amreli. The principal difficulty in rapid extension is the lack of sufficient controlled seed and the uncertainty of the season.

RAJPIPLA STATE.—The Rajpipla State has continued its policy for maintaining the improved strain (1027 *A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangement with the Bombay Department of Agriculture, (2) by th

Cotton Transport Act which prohibits and penalises the sowing or importing into the State for purposes of sowing, *Goghari* cotton seed or any other short-staple seed, and (3) by the control of ginning and pressing factories.

The best seed of 1027 *A.L.F.* was (as usual) secured by deputing an experienced *Thandar* with some leading cultivators of the State, who purchased it with the assistance and guidance of the Cotton Superintendent, Surat. The liberal policy of distributing the seed thus obtained by way of *Tacavi* to the cultivators of the State from different convenient depôts is continued from year to year and this practice has tended to raise the outturn and the quality of cotton to all that could be desired.

Another great advantage of this measure to the cultivators is that whereas in the past when the short-staple *Goghari* cotton was cultivated here in the State they were required to go some forty and fifty miles and at times still further away from their houses into British Districts to sell their cotton; now through the introduction of this measure and the success it has achieved they have found a ready market at their own doors; and therewis such a demand for it that even in these years of heavy depression, this cotton is readily sold at comparatively good prices.

Besides, this measure has stimulated the growth of meetings for the sale of the cotton crop to the highest customer at various agricultural centres in the State; and this has resulted in cultivating a spirit of combination in the cultivators to dispose of their agricultural produce at the best prices available.

Rajpipla cotton is now recognized as equal to the very best cotton and is largely sought after. In spite of the fact that the cotton crop of the various parts in Gujerat suffered to a larger or smaller extent from the effect of frost during the last season it is noted with gratification that the quality of the State cotton crop maintained its high standard of superiority over short-staple varieties and this was evident from the fact that it commanded a very high percentage of extra price in the market. Another notable feature of the quality of the last season's crop in the State was that it attracted some of the large cotton firms of Bombay from the very commencement of the season who made purchases on a large scale of the season's output of the State.

SIND.—During the decade prior to the opening of the Lloyd Barrage Canals, the annual area under cotton cultivation in Sind averaged slightly over 300,000 acres with an average outturn of approximately 100,000 bales. The area has been increased to approximately 500,000 acres during the past season, i.e., 1933 and it is confidently expected that the acreage under cotton will expand to 750,000 acres during the next few years. The area under Sind American cotton was 146,000 acres during 1933. This is likely to increase to 200,000 acres during 1934.

Three main classes of cotton.—Three main classes of cotton have been found to be successful in Sind, viz., (a) Sind *deshi*, (b) Sind American, (c) Imported Egyptians.

Among each of these three main classes the Department of Agriculture, Sind, has, by botanical selection, evolved improved strains which on account of better yield, higher ginning outturn or superior quality are suitable for extension in general cultivation in the different cotton-growing tracts of the Barrage areas.

Sind American cotton.—This cotton occupied in 1933 about 146,000 acres, out of 500,000 total acreage under cotton and is grown mostly in Thar Parkar district. 4*F* cotton was at first the most popular variety grown but is now being replaced by 289*F* cotton. The improved strains now established are definitely superior to the parental stock and are quite distinct from the original material. These are :—

Sind American 4*F*-98.—It has a staple length of 7/8″ to 15/16″ and spins 34's. It has a ginning outturn of 34% and gives a high yield. This improved strain has been found to be most suitable type for cultivation in the new cotton-growing tracts being established on the Right Bank of the Indus.

Sind American 289*F*-1.—This improved strain has a staple of 1-1/16″ and spins 40's. It has a ginning percentage of 30 and in normal years is a very high yielder. It is a cotton well adapted to *red leaf* disease, *jassid* attacks and to withstand seasonal variation of climate. This strain is particularly adapted for extension on the Left Bank of the Indus where the present cotton area is entirely located. This strain is the " bread and butter " of the cotton grower in Sind in the Barrage areas.

Imported Egyptian and Sea Island Cottons.—Selected strains of these cottons acclimatised in Sind have been produced by the Sind Agricultural Department, viz., (1 *Sea Island* 2-4, (2) *Boss III*-16 (Egyptian) have a staple length of 1⅛″—1⅛″ and are suitable for spinning 60-80's counts and (3) *Ashmouni* 37 (Egyptian) has a staple length of 1⅛″ and is suitable for spinning 50's counts. These improved strains have been tested on field scale and are found to grow well in Sind, especially in East Sind. They are, however, peculiarly susceptible to white-ant attack especially on virgin soils. In consequence their yield was only 8—12 *maunds kapas* per acre in comparison with 16—20 *maunds* obtained by Sind-American on good and virgin lands. The staple of these fine quality cottons, however, is fine and strong. They require better cultivation than Sind-American or *deshi* cotton and are suited for the best soils only. During the year 1934-35 about 150 acres have been cultivated in Sind under these cottons.

Sind Deshi Cotton.—This cotton has a special market of its own on account of its bright colour and rough feel. It is very hardy and resists variation in soil, climate and season. It can stand late sowing and in point of yield is unsurpassed by any other cotton grown in Sind. The improved Sind *deshi* strain, 27 *W. N.*, evolved by the Agricultural Department, gives an early and abundant crop (about 16—20 per cent. greater outturn than ordinary Sind *deshi* and a 4-5 per cent. higher ginning outturn, i.e., 38-39 per cent.). This improved strain is now the standard *deshi* cotton in Sind. Trade opinion in Karachi considers that the total *deshi* crop which can be profitably consumed should not exceed 200,000 bales per annum. Any increase above this figure is likely to glut the limited market and result in reduced prices to the growers.

The Economic side.—The economic side of the question which is of primary importance to the grower depends largely upon the prices prevailing for the various types of cotton. During 1933-34 these cottons were sold in large quantities at the following rates :—

	Per maund of 82 lbs. Rs. a. p.	*Per candy of 784 lbs.* Rs. a. p.
Sind American.		
4F-98	23 8 0	223 15 3
289F-1	28 0 0	266 13 5
Sind Egyptian.		
Sea-Island 2-4	41 15 6	400 0 0
Boss III-16	39 14 0	380 0 0
Ashmouni 37	34 1 7	325 0 0
Sind *Deshi* 27 W.N.	17 0 0	162 0 0

For successful cultivation of stapled and fine quality cottons it is necessary to evolve a reliable marketing organization which will secure adequate premium for quality from the trade. The Indian mills have of late shown considerable interest in these long-stapled cottons and it is up to them to give an encouragement to the growers of these cottons for their future supply.

Extension and Pure Seed Multiplication.—The pure seed extension scheme is based on ' unit ' system, each unit representing a final area of 25,000 acres under one improved variety. In this scheme which has now reached its third stage the programme adopted

or multiplication and distribution of pure seed consists of five progressive stages, viz., (1) Seed patch 2½ acres, (2) Increase block 25 acres, (3) Field scale plantings 250 acres, (4) Village groups 2,500 acres, (5) District groups 25,000 acres. The first three stages are under departmental supervision, the last two stages are being arranged through selected growers and co-operative organizations. Nine of such units have been started to supply seed to different cotton-growing tracts.

UNITED PROVINCES.—*C* 520.—This is an early flowering white-flowered type of Bengals with high yield and ginning percentage which was isolated as the result of a survey of botanical types from Saharanpur and Bijnor Districts of 1919 and 1920. Being a high yielder, and superior to *A*·19 in spinning properties, it is becoming popular among cotton growers in the western districts and may ultimately replace *A*·19. The quantity of *C* 520 seed distributed during the year amounted to 662 *maunds*. The area under pure *C* 520 is now 5,430 acres and of *A*·19 is 21,400 acres.

C 402$_{25}$—2. This strain spins 16—20's which are counts widely spun by the local mills. Its ginning percentage is 33. It is thus a valuable cotton to the local industry as well as for the producer. It requires early sowing under artificial irrigation and is being developed in a tract of the Sarda Canal area comprising Unao, Hardoi and portions of Lucknow and Sitapur Districts.

This cotton is expected to extend, under departmental propaganda and with co-operative disposal of the crop, from its present area of about 3,000 acres to 30,000 acres or more.

3. A botanical survey of the areas in Bundelkhand and Rohilkhand, which provided the styles known to the trade as Harpalpur, Kashipur and Chandausi, is being made with the assistance of the Indian Central Cotton Committee. About 5,000 samples were collected from which about 400 of the most promising are under study on the Cawnpore Research Farm. These are expected to yield for distribution types which would re-establish the quality of the old styles largely lost through mixtures.

APPENDIX VIII.

BALANCE SHEET AS AT MARCH 31ST, 1934.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		91,08,563 8 6	I. A. Administration		14,28,333 3 5
INTEREST ACCOUNT—			B. *Improvement of Cotton Marketing* :—		
Amount received on investments	13,45,676 8 10		1. Cost of exhibits, moisture tests, etc.	74,779 0 2	
Add—Refund of income-tax deducted from interest	17,078 0 0		2. Cost of growing cotton in India	67,500 0 0	
	13,62,754 8 10				1,42,279 0 2
Less :—			C. *Seed Distribution and Extension Schemes* :—		
1. Interest paid in advance at the time of purchasing Government Paper (since recovered), interest on temporary overdraft and Bank's commission for collection of interest	43,712 8 9		I. *Bombay* :—		
			1. Hubli	25,472 13 9	
			2. Gadag	27,988 4 9	
			3. Gadag Supplementary	15,752 5 11	
			4. Khandesh	89,407 6 9	
			5. Surat	25,589 0 7	
			6. Athani	7,380 4 0	
2. Interest credited to Provident Fund Account	4,886 6 2		II. *Madras* :—		
3. Bank's withdrawal charges for securities sold	2,366 1 0		1. Pay and allowance of Business Manager, Tiruppur	8,729 0 0	
4. Income-tax deducted on interest	19,967 12 8		2. Co. 2	7,828 12 6	
5. Brokerage for sterling loan sold	291 9 0		3. H1.	4,480 0 0	
6. Provision for Sinking Fund	4,728 7 0		III. Sind	86,245 4 11	
	75,952 12 7		IV. Hyderabad	17,148 12 9	
		12,86,801 12 3	V. Central Provinces	71,310 11 5	
Profit on conversion and sale of Securities		53,671 12 7	VI. Lyallpur Ginnery	17,740 5 0	
Sinking Fund Account		4,728 7 0			4,05,073 2 4
			D. *Printing and Propaganda* :—		
			1. Publicity and Propaganda	41,309 10 0	
			2. Printing and Distribution	23,838 7 0	
					65,148 1 0
			E. Statistical Research		5,463 0 0
Carried over		1,04,53,765 8 4	Carried over	....	20,46,296 6 11

BALANCE SHEET AS AT MARCH 31ST, 1934—*contd.*

RECEIPTS.	Rs.	a.	p.
Brought forward	1,04,53,765	8	4
Miscellaneous receipts	23,466	5	2
Refund from Provident Fund for contributions not disallowed	3,391	1	11
Suspense receipts	1	0	0
Carried over	1,04,80,623	15	5

EXPENDITURE.	Rs.	a.	p.	Rs.	a.	p.
Brought forward ..				20,46,296	6	11
II. *Technological Research* :—						
(1) *Technological Laboratory* :—						
A. Capital Expenditure :—						
1. Land and Buildings	3,77,917	7	3			
2. Machinery	36,336	1	8			
3. Freight	7,502	2	8			
4. Apparatus and Equipment	41,558	3	7			
5. Machinery Workshop	5,789	8	3			
B. Working Expenses	13,59,655	4	0			
(2) Provincial.	50,633	6	3			
				19,29,392	1	8
III. Research Studentships.				2,20,814	2	6
AGRICULTURAL RESEARCH GRANTS.						
IV. *Bombay* :—						
1. A. Surat Physiological	2,45,139	11	3			
B. ,, ,, Writing-up	6,035	7	6			
2. A. ,, Bollworm	1,14,509	9	7			
B. ,, ,, Propaganda	94,844	3	3			
C. ,, ,, Writing-up	2,315	3	0			
3. A. Dharwar Wilt	1,82,836	4	11			
B. ,, ,, Writing-up	10,757	14	3			
4. Khandesh Cotton Breeding	26,573	6	0			
5. Co-ordination of Cotton Research	1,749	7	6			
6. Jalgaon Cotton Breeding	13,394	8	9			
7. Broach Cotton Breeding	19,738	11	3			
8. Small Leaf Disease	1,828	0	0			
V. *Madras* :—						
(*a*) Herbaceum	1,04,482	12	2			
(*b*) Pempheres and Physiological	50,439	5	9			
(*c*) Fodder Cholam	7,757	10	4			
(*d*) Nadam Cotton Breeding	2,328	0	0			
VI. *Punjab* :—						
(*a*) Botanical	4,08,667	0	7			
(*b*) Entomological	1,34,251	12	4			
(*c*) White Fly	30,610	5	0			
(*d*) Root Rot	5,403	7	0			
(*e*) Spraying Trials	6,958	12	0			
(*f*) Defibrating and Delinting	7,700	0	0			
VII. Central Provinces	3,09,831	12	3			
VIII. *United Provinces* :—						
(*a*) Pink Boll-worm	1,46,731	6	10			
(*b*) Rohilkhand and Bundelkhand Cotton Survey ..	4,985	0	0			
Carried over ..	19,39,869	11	6	41,96,502	11	1

BALANCE SHEET AS AT MARCH 31ST, 1934—*concld.*

RECEIPTS.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,04,80,623 15 5	Brought forward ..	19,39,869 11 6	41,96,502 11 1
		AGRICULTURAL RESEARCH GRANTS—*contd.*		
		IX. Institute of Plant Industry, Indore	12,21,343 12 0	
		X. Sind	1,57,361 13 8	
		XI. *Burma*.—		
		(*a*) Capital	2,906 15 5	
		(*b*) Cotton Improvement	18,486 11 6	
		XII. *Hyderabad*.—		
		(*a*) Botanical	1,13,469 13 11	
		(*b*) Cotton Survey	18,047 1 0	
		(*c*) Pink and Spotted Bollworm	7,680 0 0	
		XIII. Bikaner.	28,376 6 9	
		XIV. *Baroda*.—		
		(*a*) Root Rot	22,667 10 9	
		(*b*) Comparative Tests	4,251 5 3	
				35,34,461 5 9
		Total Expenditure ..		77,30,964 0 10
		XV. Loans Recoverable (but considered doubtful) :—		
		1. Co-operative Cotton Sale Society, Hubli	8,063 9 3	
		2. Co-operative Cotton Sale Society, Gadag	7,292 0 0	
				15,355 9 3
		Suspense Account		2,932 7 6
		By Balance		27,31,371 13 10
Grand Total ..	1,04,80,623 15 5	Grand Total ..		1,04,80,623 15 5

BALANCE SHEET AS AT MARCH 31ST, 1934.

Provident Fund Account.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Subscribers' contributions ..	1,40,336 13 9		By advances to subscribers ..	25,038 3 0	
Less—Payments made to subscribers resigned	34,251 15 3	1,06,084 14 6	*Less*—Recoveries made up to 31st March 1934	23,378 0 0	1,660 3 0
Committee's contributions ..	1,37,286 8 11		Accrued interest on Government Paper credited to subscribers up to 31st March 1934		1,738 2 0
Less—Payments made to subscribers resigned and forfeitures to the Committee and to the Lapses and Forfeitures Account.	32,220 1 11	1,05,066 7 0			
Suspense deposit of Mr. Dutt's own contributions with interest ..		968 1 10	By Balance		2,32,951 12 10
Investment Fluctuation Account .		23,984 9 5			
Lapses and Forfeitures Account ..		246 1 1			
Total ..	....	2,36,350 1 10	Total ..	....	2,36,350 1 10

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED MARCH 31ST, 1934.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
*Opening Balance ..	29,69,854 12 9		Administration of the Committee (including Improvement of Cotton Marketing, Seed Distribution and Extension, Printing and Propaganda).		3,43,030 13 8
Less—Adjustment of Dr. Pendleton's account ..	4 3 0		Agricultural Research Grants-in-Aid		4,09,543 14 9
		29,69,850 9 9	Technological Research		1,99,412 1 4
Receipts under Section 12 of the Indian Cotton Cess Act, 1923 ..		5,83,672 8 7	Closing Balance (Government Paper at Cost) :—		
†Other receipts		6,499 9 7	3½% Government Promissory Notes of the face value of .. Rs. 7,06,300	4,43,583 2 5	
Interest on investments .		1,32,624 0 5	3½% Government of India Loan 1947-50, face value of .. ,, 2,75,000	2,18,032 13 0	
			‡4% Government of India Loan 1960-70, face value of .. ,, 10,01,900	9,06,285 8 10	
			4½% Government of India Loan 1956-60, face value of .. ,, 26,600	25,004 0 0	
			5% Government of India Loan 1939-44, face value of .. ,, 3,09,000	2,96,679 13 6	
			6% Bombay Municipal Debentures 1954, face value of .. ,, 50,000	56,500 0 0	
			6% Karachi Port Trust Coupon Debentures 1956, face value of .. .. ,, 1,30,000	1,41,212 8 0	
			6% Rangoon Municipal Debentures 1955, face value of .. ,, 3,83,500	4,15,328 2 0	
			3½% India Sterling Loan Bearer—face value of .. .. £ 20,000	2,20,688 14 10	
			(Market value on 31st March 1934 Rs. 31,40,888-7-0)	27,23,314 14 7	
			Imperial Bank of India Current Account	4,721 4 10	
			Imprest—Committee's Accounts as certified by the Secretary 1,500 0 0		
			Technological Laboratory as certified by the Director, Technological Laboratory 500 0 0		
			High Commissioner for India, London, for scholarships (£100) 1,335 10 5		
				3,335 10 5	
			Suspense (Recoverable)	2,932 7 6	
			Loans recoverable (but considered doubtful)	15,355 9 3	
			§Total Closing Balance		27,49,659 14 7
	Total ..	36,92,646 12 4		Total ..	36,92,646 12 4

*Includes Rs. 3,672-2-0 on account of Sinking Fund and Rs. 15,355-9-3 against Loans recoverable from Hubli and Gadag Co-operative Cotton Sale Societies.

†Includes Rs. 1,056-5-0 against provision for Sinking Fund for the year 1933-34 and Rupee one recovered in excess from the Director of Agriculture, Mozambique, against cost of cotton seeds supplied to him.

‡4% Government of India Loan 1960-70 of the face value of Rs. 116,900 has been deposited with the Imperial Bank of India for security against overdraft that may be required by the Committee.

§This includes Rs. 4,728-7-0 on account of provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required and certify that to the best of our information and explanations received, the above Statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, *27th April* 1934.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

PROVIDENT FUND ACCOUNT AS AT MARCH 31ST, 1934.

Receipts.	Rs. a. p.	Rs. a. p.	Payments.	Rs. a. p.	Rs. a. p.
Opening Balance as on 1st April 1933		1,70,531 0 11	By Balance :—		
	Rs. a. p.		(Securities in Government Paper at Market Price).		
Subscribers' contributions	17,606 6 0		3½% Government Promissory Notes of the face value of .. Rs. 85,600..	75,970 0 0	
Less—Refunds for recoveries disallowed by Accountant-General, Bombay	22 5 0		4% Government of India Loan 1934-37 of the face value of .. Rs. 2,000..	2,012 8 0	
	17,584 1 0		4% Government of India Loan 1960-70 of the face value of .. Rs. 32,600..	33,578 0 0	
Add—Recoveries against advances. .	3,141 12 0		5% Government of India Loan 1939-44 of the face value of .. Rs. 25,600..	27,456 0 0	
		20,725 13 0	6½% Bombay Improvement Trust Loan of the face value of .. .. Rs. 17,500..	18,681 4 0	
		1,91,256 13 11	Savings Bank Deposit Account with the Imperial Bank of India	38,456 8 3	
Less—Refunds to subscribers resigned, including wrong recoveries to Indian Central Cotton Committee	2,435 4 8		Savings Bank Account with the Imperial Bank of India	16,734 2 0	
Advances to subscribers	2,855 14 0		Current Account with the Imperial Bank of India	20,063 6 7	
		5,291 2 8			
		1,85,965 11 3	*Total Closing Balance		2,32,951 12 1
Committee's contribution received from Indian Central Cotton Committee at 100 %		17,584 1 0			
		2,03,549 12 3			
Less—Payments to subscribers who have resigned including transfers to Lapses and Forfeitures Account for contributions disallowed and wrong recoveries to Indian Central Cotton Committee.		2,391 3 10			
			2,01,158 8 5		
Interest received on Investments		7,465 11 3			
Interest received on advances to subscribers ..		185 4 1			
Refund of Income-tax deducted on Interest received during 1932-33		221 13 0			
		7,872 12 4			
Less—Interest paid during the year to subscribers who have resigned :—					
	Rs. a. p.				
On their own contributions ..	63 12 8				
On Committee's contributions	61 11 6				
Income-tax deducted from interest on investments (recoverable) ..	105 5 3				
Bank's commission for collection of interest	17 13 0				
Cost of Stationery, Printing, Sundry charges, etc.	61 8 0				
		310 2 5			
			7,562 9 11		
Lapses and Forfeitures Account			246 1 1		
Investment Fluctuation Account			23,984 9 5		
Total ..	....	2,32,951 12 10	Total ..	....	2,32,951 12 10

*Includes Rs. 963-1-10 being Suspense Deposit with interest thereon of Mr. Dutt's own contribution.

Examined and found correct.

(Sd.) S. B. Billimoria & Co.,
Registered Accountants, Auditors.

Bombay, 27*th April* 1934.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1934.

Major Heads.	Total sanctioned grant.	Period. Yrs.	Mths.	Date of starting of work.	Total Expenditure up to 31st March 1934.	Expenditure from Capital Grants on (a) Lands and buildings.	Expenditure from Capital Grants on (b) Machinery, apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3		4	5	6	7	8	9	10
	Rs. a. p.				RESEARCH SCHEMES, Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
II. *Technological Research*—										
(1) Technological Laboratory—										
(a) Capital Expenditure ..	5,28,799 3 8	} Permanent		1923	5,17,786 11 10	3,77,917 7 3	1,39,869 4 7	....	....	
(b) Working Expenses ..	13,60,971 15 7			Jan. 1924	13,60,971 15 7	....	1,316 11 7	38,975 4 0	13,20,680 0 0	
(2) Provincial	50,633 6 3			April 1928	50,633 6 3	....	....	2,631 13 0	48,001 9 3	
Agricultural Research Grants.										
IV. *Bombay Schemes*—										
(1) Surat Physiological and Writing-up	2,91,445 0 0	10	1	Sept. 1923	2,51,175 2 9	....	....	23,334 5 2	2,27,840 13 7	Physiological Scheme closed down on 4th August 1932 and Writing-up Scheme closed down on 17th October 1933.
(2) (a) Surat Boll-worm ..	1,20,720 0 0	7	7	Sept. 1923	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	Scheme closed down on 31st March 1931.
(b) Surat Writing-up ..	2,420 0 0	0	4	July 1932	2,315 3 0	....	....	....	2,315 3 0	
(c) Surat Propaganda and Clean-up	1,28,764 0 0	3	3	April 1931	94,844 3 3	....	....	10,828 0 11	84,016 2 4	
(3) Dharwar—										
(a) Wilt and Cotton Breeding	2,63,545 0 0	8	9	Sept. 1923	1,82,836 4 11	....	....	13,713 3 7	1,69,123 1 4	Scheme closed down on 31st July 1932 and in July 1929.
(b) Writing-up	11,355 0 0	0	10	June 1932	10,757 14 3	....	....	....	10,757 14 3	Scheme closed down on 31st March 1933.
(4) Khandesh Cotton Breeding .	27,995 0 0	5	6	Oct. 1926	26,573 6 0	....	....	....	26,573 6 0	Scheme closed down on 31st March 1932.
(5) Broach Cotton Breeding ..	67,885 0 0	5	0	April 1932	19,738 11 3	....	....	2,263 4 0	17,475 7 3	
(6) Jalgaon Cotton Breeding ..	41,111 0 0	5	0	April 1932	13,394 8 9	....	....	631 2 3	12,763 6 6	
(7) Co-ordination of Cotton Research	23,991 0 0	....		Not to start.	1,749 7 6	....	....	....	1,749 7 6	
(8) Survey of Small Leaf Disease of cotton	5,298 0 0	1	0	Nov. 1933	1,828 0 0	....	....	349 5 6	1,478 10 6	
V. *Madras Schemes*—										
(1) Herbaceum	1,16,263 0 0	11	6	Dec. 1923	1,04,482 12 2	....	....	4,422 8 10	1,00,060 3 4	
(2) Pempheres & Physiological .	2,12,779 0 0	7	0	Sept. 1931	50,439 5 9	....	....	5,347 13 0	45,091 8 9	
(3) Fodder Cholam—										
(a) Capital	900 0 0	} 5	5	Jan. 1931	7,757 10 4	....	881 11 7	....	....	
(b) Recurring..	16,800 0 0					....	....	167 10 9	6,708 4 0	
(4) Nadam Cotton Breeding ..	13,730 0 0	5	0	June 1933	2,328 0 0	....	....	290 8 6	2,037 7 6	†Rs. 2,030 transferred to capital from working grant.
VI. *Punjab Schemes*—										
(1) Botanical—										
(a) Capital Expenditure ..	31,330 0 0	} 9	8	Aug. 1925	4,08,667 0 7	22,158 0 0	9,102 11 0	....	....	‡Figures subject to revision on receipt of Annual Return for 1933-34.
(b) Working Expenditure ..	†5,23,900 0 0					....	....	29,021 5 0‡	3,48,385 0 7	

Major Heads.	Total sanctioned grant.	Period. Yrs.	Mths.	Date of starting of work.	Total Expenditure up to 31st March 1934.	Expenditure from Capital Grants on (a) Lands and buildings.	(b) Machinery, apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3		4	5	6	7	8	9	10
VI. *Punjab Schemes*—contd.					RESEARCH SCHEMES—*contd.*					
(2) Entomological—	Rs. a. p.				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(*a*) Capital Expenditure ..	6,000 0 0	10	11	May 1926	1,34,251 12 4	....	5,826 3 10	....	....	
(*b*) Working Expenditure ..	2,40,410 0 0						....	8,227 0 6	1,20,198 8 0	
(Pink & Spotted Boll-worm)										
(3) White Fly	56,087 0 0	4	11	May 1931	30,610 5 0	....	....	*3,048 7 3	27,561 13 9	*Figures subject to revision on receipt of Annual Return for 1933-34.
(4) Root Rot	13,506 0 0	3	0	Sept. 1932	5,403 7 0	....	....	76 12 6	5,326 10 6	
(5) Spraying Trials	12,500 0 0	1	0	July 1933	6,958 12 0	....	....	*2,815 12 0	4,143 0 0	
(6) Physiological	1,06,530 0 0	....		Not started.	....	....	....	....	....	
Defibrating and Delinting Plant—										
(*a*) Recurring	1,000 0 0	....		....	7,700 0 0	....	†	....	....	†Expenditure being made in 1934-35.
(*b*) Non-recurring	6,700 0 0									
8) Survey of disease of malformation	2,674 0 0	1	0	June 1934	....	....	....	....	....	
VII. *Central Provinces*—										
(1) Botanical	‡61,000 0 0	2	6	Oct. 1923	3,09,831 12 3	....	....	4,539 4 10	3,05,292 7 5	‡The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
(2) Entomological	5,36,150 0 0	13	0	April 1926						
	6,773 0 0	2	0	July 1934	....	....	....	....	....	
VIII. *United Provinces*—										
(1) Pink Boll-worm Scheme—										
(*a*) Capital Expenditure ..	54,000 0 0	8	0	July. 1923§	1,46,731 6 10	....	47,834 13 6	....	95,831 5 1	§Scheme closed down on 31st July 1931.
(*b*) Working Expenses ..	56,000 0 0					....	....	3,065 4 3		§§Scheme closed down on 12th July 1934.
(*c*) Recurring grant for staff	44,475 0 0	7	9½	Oct. 1926§§		....	....	....		
(2) Rohilkhand and Bundelkhand Cotton Survey	15,800 0 0	3	0	July 1933	4,985 0 0	....	....	1,023 13 0	3,961 3 0	
IX. *Institute of Plant Industry, Indore.*										
(*a*) Capital Expenditure ..	‖2,83,535 12 10	Permanent.		Oct. 1924	12,21,343 12 0	2,12,552 11 5	70,983 1 5	....	....	‖Rs. 50,202-12-10 transferred from Recurring Grant to Capital.
(*b*) Working Expenses ..	9,37,807 15 2					....	....	31,857 4 4	9,05,950 10 10	
X. *Sind*..	2,74,346 0 0	9	9	July 1927	1,57,361 13 8	....	....	17,223 8 5	1,40,138 5 3	
XI. *Burma*—										
(*a*) Capital Expenditure ..	3,000 0 0	....		....	2,906 15 5	....	2,906 15 5	....	....	
(*b*) Cotton Improvement ..	49,032 0 0	6	0	April 1931	18,486 11 6	....	....	2,926 8 0	15,560 3 6	
XII. *Hyderabad*—										
(*a*) Botanical	3,59,617 0 0	9	11	May 1929	1,13,469 13 11	....	....	6,463 9 2	1,07,006 4 9	
(*b*) Cotton Survey	39,165 0 0	4	10	June 1931	18,047 1 0	....	....	149 6 7	17,897 10 5	
(*c*) Pink and Spotted Boll-worm	28,490 0 0	3	0	June 1933	7,680 0 0	....	....	123 12 11	7,556 3 1	
XIII. *Bikaner*—										
(*a*) Capital Expenditure ..	14,500 0 0	5	0	Jan. 1931	28,376 6 9	8,584 6 9	3,735 1 9	....	....	
(*b*) Working Expenses ..	38,200 0 0					....	....	....	16,056 14 3	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1934—*concld.*

Major Heads.	Total sanctioned grant.	Period. Yrs. Mths.	Date of starting of work.	Total Expenditure up to 31st March 1934.	Expenditure from Capital Grants on (a) Lands and buildings.	Expenditure from Capital Grants on (b) Machinery, apparatus and other moveable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.			RESEARCH SCHEMES—*concld.* Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
XIV. *Baroda*—									
(*a*) Root Rot	58,179 0 0	5 0	Feb. 1932	22,667 10 9	....	....	2,517 4 1	20,150 6 8	
(*b*) Comparative Tests of 1027 and 1A cottons	4,280 0 0	1 2	April 1932	4,251 5 3	....	....	145 11 6	4,105 9 9	
XV. *Bengal Comilla Cotton*	18,540 0 0	5 0	Not started.	....	....	....	....	....	
				I. C. SEED DISTRIBUTION AND EXTENSION SCHEMES.					
1. *Bombay*—									
(*i*) Hubli	40,800 0 0	5 0	June 1930	25,472 13 9	....	....	....	25,472 13 9	
(*ii*) Gadag	44,875 0 0	5 0	June 1930	27,988 4 9	....	....	....	27,988 4 9	
(*iii*) Gadag Supplementary ..	21,448 0 0	4 0	June 1931	15,752 5 11	....	....	2,845 1 0	12,907 4 11	
(*iv*) Haveri	27,752 0 0	5 0	....	....	....	....	....	....	Not yet started.
(*v*) Athani	46,757 0 0	5 0	April 1932	7,380 4 0	....	....	1,001 14 0	6,378 6 0	
(*vi*) Bailhongal	27,425 0 0	5 0	....	....	....	....	....	....	Not yet started.
(*vii*) Surat	96,050 0 0	9 0	April 1930	25,589 0 7	....	....	....	25,589 0 7	
(*viii*) Khandesh	*2,70,340 0 0	5 0	May 1931	89,407 6 9	....	....	9,908 5 11	79,499 0 10	*Recoveries amounting to Rs. 1,10,000-0-0 are anticipated from this scheme which will reduce the actual cost from Rs. 2,70,340-0-0 to Rs. 160,340-0-0.
(*ix*) Deccan Canals (Banilla)..	*23,800 0 0	5 0	April 1934	....	....	....	....	....	
2. *Madras*—									
(*i*) Pay and allowances of Business Manager, Tiruppur	21,050 0 0	5 0	May 1931	8,729 0 0	....	....	....	8,729 0 0	The balance of Rs. 1,702-1-9 has since been refunded.
(*ii*) Co.2	81,310 0 0	5 0	Sept. 1932	7,828 12 6	....	....	83 13 0	7,744 15 6	
(*iii*) H. 1	18,860 0 0	2 0	May 1933	4,480 0 0	....	....	....	4,480 0 0	
3 *Punjab-Lyallpur Ginnery*	18,125 0 0	....	....	17,740 5 0	9,221 5 0	6,816 14 3	....	....	
4. *Sind*	3,89,540 0 0	8 0	April 1931	86,245 4 11	....	....	‡4,910 9 3	81,334 11 8	‡Figures subject to revision on receipt of Final Annual Return for 1933-34.
5. *Hyderabad State*	32,400 0 0	6 0	March 1930	17,148 12 9	....	....	....	17,148 12 9	
6. *Central Provinces*—									
(*i*) Verum cotton	1,17,900 0 0	About 4 years.	Sept. 1930	71,310 11 5	....	....	....	71,310 11 5	
(*ii*) Long-staple cotton ..	86,298 0 0	3 0	April 1934	....	....	....	....	....	
7. *Baroda*	25,600 0 0	5 0	April 1934	....	....	....	....	....	
8. *Punjab*—									
Sale of all farm crop produce ..	‖15,000 0 0	3 0	....	....	....	..	....	....	Not yet started.

APPENDIX IX.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1.	Secretary	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S. ..	On deputation from Madras Department of Agriculture.
2.	Deputy Secretary	Vacant	
3.	Publicity Officer	Mr. R. D. Mihra, M.A. Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), Post-Grad., Res. B. Litt. (Oxon.).	——

TECHNOLOGICAL LABORATORY, BOMBAY.

4.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.) ..	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
5.	Spinning Master	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
6.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
7.	Senior Research Assistant (Assistant Technologist).	Mr. D. F. Kapadia, M.Sc., Tech. (Manch.), B.A. (Bom.).	Research Scholar, Technological Laboratory (Textile Physics).
8.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
9.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Research Scholar, Technological Laboratory (Textile Physics).
10.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U. P.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

11.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).
12.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
13.	Electrician	Mr. Herculano Lobo, L..E.E. (V. J. T. I.) ..	——
14.	Spinning Asistant	Mr. N. Iyengar	——
15.	Senior Tester	Mr. S. B. Joshi, B.Sc.	——
16.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V. J. T. I.) ..	——
17.	Junior Tester	Mr. K. G. Deo	——
18.	Junior Tester	Mr. K. S. Marar, B.A., LL.B.	——
19.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
20.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
21.	Junior Tester	Mr. K. V. N. Nayar	——
22.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
23.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
24.	Junior Tester	Mr. P. S. Sambamurthy	——
25.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
26.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——
27.	Junior Tester	Mr. A. J. Farid	——
28.	Junior Tester	Mr. U. K. Benegal, B.A.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

29.	Junior Tester	Mr. P. V. Nachane, B.Sc.		——
30.	Junior Tester	Mr. M. A. Gangat, B.Sc.		——
31.	Junior Tester	Mr. A. B. Khan, B.Sc.		——
32.	Draughtsman	Mr. B. G. Mehta		——
33.	Instrument Maker	Mr. M. M. Patke		——
34.	Statistical Clerk	Mr. R. Krishna Iyer		——
35.	Statistical Clerk	Mr. P. K. Wagle		——

INSTITUTE OF PLANT INDUSTRY, INDORE.

36.	Director	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.).	Director of Research, Department of Agriculture, Iraq (1923-30).	
37.	Geneticist and Botanist	Mr. J. B. Hutchinson, M.A. (Cantab.)	Assistant Geneticist and Botanist, Trinidad (1926-33).	
38.	Chemist and Agronomist	Mr. Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Research Student, Indian Central Cotton Committee.	
39.	Extension Officer	Mr. Misri Lal Saxena, L.Ag. (Cawnpore)	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.	
40.	Farm Superintendent	Mr. G. C. Tambe, B.Ag. (Bombay)	——	
41.	Plant Breeding Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	——	
42.	Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)	——	
43.	Assistant Farm Superintendent	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*contd.*

44.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	——
45.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow) ..	——
46.	Statistical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	——
47.	Genetical Assistant	Mr. Bholanath, M.Sc. (Punjab)	——
48.	Junior Plant Breeding Assistant (Temporary).	Mr. N. S. Apte, B.Ag. (Bombay)	——
49.	Artist	Mr. S. Ayyer	On deputation, belongs to Madras Subordinate Agricultural Service.

BOMBAY RESEARCH SCHEMES.

(*i*) *Broach Cotton Breeding Scheme.*

50.	Cotton Breeder	Mr. P. L. Patel, M.Sc. (Iowa, U.S.A.) ..	——
51.	Botanical Assistant	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
52.	Pathological Assistant	Mr. Y. S. Kulkarni, B.Ag. (Bombay) ..	——

(*ii*) *Jalgaon Cotton Breeding Scheme.*

53.	Botanical Assistant	Mr. V. L. Bhosekar, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
54.	Pathological Assistant	Mr. J. D. Ranadive, B.Ag. (Bombay) ..	Research Student, Indian Central Cotton Committee.

(*iii*) *Small Leaf Disease Survey Scheme.*

55.	Agricultural Overseer	Mr. V. P. Gokhale, B.Ag. (Bombay)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

		BOMBAY SEED DISTRIBUTION SCHEMES.			
		(*i*) *Hubli Scheme.*			
56.	Agricultural Overseer	Mr. B. S. Patil, B.Ag. (Bombay)		——	
		(*ii*) *Gadag Scheme.*			
57.	Agricultural Overseer	Mr. B. S. Tadsur, B.Ag. (Bombay)		——	
58.	Manager, Seed Farm, Gadag	Mr. G. Y. Kurli, School Final	On deputation from Bombay Department of Agriculture.		
		(*iii*) *Surat Scheme.*			
59.	Cotton Assistant	Mr. V. D. Desai	Do.	Do.	
60.	Agricultural Overseer	Mr. V. V. Patel, B.Ag. (Bombay)	Do.	do.	
		(*iv*) *Athani Scheme.*			
61.	Agricultural Overseer	Mr. B. M. Dhumma, B.Ag. (Bombay) ..		——	
		(*v*) *Khandesh* (*Banilla*) *Scheme.*			
62.	Cotton Superintendent, Amalner ..	Mr. S. V. Shevde, L.Ag.	On deputation from Bombay Department of Agriculture.		
63.	Agricultural Overseer	Mr. R. B. Nimbalkar, B.Ag. (Bombay) ..	Do.	do.	
64.	Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag. (Bombay) ..	Do.	Do.	
		SIND PHYSIOLOGICAL RESEARCH SCHEME.			
65.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)		——	
66.	Senior Assistant	Dr. A. M. Shah, M.Sc. (Bombay), Ph. D. (London), D.I.C., A.I.C.		——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

SIND PHYSIOLOGICAL RESEARCH SCHEME—*contd.*

67.	Junior Assistant	Mr. Rustom M. Ranji, Dip.Ag. (Bombay) ..	——
68.	Junior Assistant	Mr. R. N. Gidwani, B.Ag. (Bombay).. ..	Research Student, Indian Central Cotton Committee.
69.	Junior Assistant	Mr. T. J. Malkani, M.Sc. (with distinction) (Bombay).	——
70.	Statistical Assistant	Mr. S. S. Chiney, B.Sc. (Agra)	——

SIND SEED DISTRIBUTION SCHEME.

71.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. K. H. Advani, B.Ag. (Bombay), M.Sc. (Texas, U.S.A.)	On deputation from Bombay Department of Agriculture.
72.	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture.
73.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. H. W. Mughal, B.Ag. (Bombay) ..	——
74.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. P. Shahani, B.Ag. (Bombay).. ..	——
75.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj P. Tejwani	On deputation from Sind Department of Agriculture.
76.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. G. A. Shaikh, B.Ag. (Bombay) ..	——
77.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani, F.Y.A.	——
78.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. M. S. Pherwani, B.Ag. (Bombay) ..	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

SIND SEED DISTRIBUTION SCHEME—*contd.*

79.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Partabsingh J. Bakshi	——
80.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. G. Pirzada, B.Ag. (Bombay)	——
81.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. J. W. Adwani, B.Ag. (Bombay)	——
82.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. T. C. Sajnani, B.Ag. (Bombay)	——
83.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. S. A. Sidiki, Dip.Agri. (Bombay) ..	——
84.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. K. Tharumal	On deputation from Sind Department of Agriculture.
85.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. T. T. Naraindas	——

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME.

86.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture.
87.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post-Graduate, Pusa.	Do. do.
88.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
89.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.
90.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME—*contd.*

91.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	On deputation from Central Provinces Department of Agriculture.
92.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	——

LONG-STAPLE COTTON SCHEME IN C. P. AND BERAR.

93.	Agricultural Assistant	Mr. S. K. Waishampayan, B.Ag.	——
94.	Agricultural Assistant	Mr. J. P. Tiwari, B.Ag.	——
95.	Agricultural Assistant	Mr. L. P. Khare, B.Ag.	——
96.	Agricultural Assistant	Mr. V. N. Wardadkar, B.Ag.	——
97.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
98.	Agricultural Assistant	Mr. N. B. Chincholkar, B.Ag.	——
99.	Agricultural Assistant	Mr. J. N. Kelkar, B.Ag.	——
100.	Agricultural Assistant	Mr. B. P. Rawat, B.Ag.	——
101.	Agricultural Assistant	Mr. B. M. Chandel, B.Ag.	——
102.	Agricultural Assistant	Mr. G. C. Tiwari, Certificate Course of Agricultural College, Nagpur.	——
103.	Agricultural Assistant	Mr. W. R. Patwardhan, B.Ag.	——
104.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
105.	Agricultural Assistant	Mr. Mohammad Ishaque, B.Ag.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

MADRAS RESEARCH SCHEMES.

(*i*) *Herbaceum Scheme.*

106.	Senior Assistant	Mr. R. Balasubramania Ayyar, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.	
107.	Junior Assistant	Mr. G. Seshadri Ayyangar, M.A.	——	
108.	Junior Assistant	Mr. V. Ramaswami Mudaliar, B.A.	——	
109.	Sub-Assistant	Mr. D. Devasirvatham, S.S.L.C., Government Tech. Examination in Botany (Intermediate).	On deputation from Madras Department of Agriculture.	

(*ii*) *Pempheres and Physiological Scheme.*

110.	Assistant Botanist	Mr. K. Dharmarajulu, M.Sc. (Bombay) ..	Research Student, Indian Central Cotton Committee.	
111.	Assistant Chemist	Mr. M. Suryanarayana, B.Sc. (Calcutta), M.Sc. (Madras).	On deputation from Madras Department of Agriculture.	
112.	Assistant Entomologist	Mr. V. Margabandu, B.A. (Hons.)	Do.	do.

(*iii*) *Fodder Cholam Scheme.*

113.	Assistant	Mr. S. Sundaram, B.A., B.Sc. (Agri.) ..	Do.	do.
114.	Assistant	Mr. M. R. Balakrishnan, B.A., B.Sc. (Agri.). .	Do.	do.

(*iv*) *Breeding of Nadam Cotton.*

115.	Assistant	Mr. K. L. Ramakrishna Rao, S.S.L.C., L.Ag.. .	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1934—*contd.*

MADRAS SEED DISTRIBUTION SCHEMES.

(*i*) *Pay of Business Manager.*

116.	Business Manager, Tiruppur Co-operative Trading Society, Ltd.	Mr. K. Avudanayakam Pillai, S.S.L.C., L.Ag.	On deputation from Madras Department of Agriculture.	

(*ii*) *Co. 2 Scheme.*

117.	Agricultural Demonstrator	Mr. M. Damodara Prabhu, B.Sc. (Agri.) ..	Do.	do.
118.	Agricultural Demonstrator	Mr. L. Krishnan, B.A., B.Sc. (Agri.)	Do.	do.
119.	Agricultural Demonstrator	Mr. P. P. Syed Mohammad, B.Sc. (Agri.) ..	Do.	do.
120.	Agricultural Assistant	Mr. P. N. Muthuswami, B.Sc. (Agri.). . ..	Do.	do.
121.	Agricultural Assistant	Mr. T. S. Lakshmanan, B.Sc. (Agri.). . ..	Do.	do.

PUNJAB RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

122.	Cotton Research Botanist	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee, and State Research Scholar. On deputation from Punjab Department of Agriculture.
123.	Assistant to Cotton Research Botanist. .	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.
124.	Agricultural Assistant	Bh. Autar Singh, B.Sc. (Agri.)	——
125.	Agricultural Assistant	Mr. Akbar Ali, B.Sc. (Post-Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*i*) *Botanical Scheme—contd.*

126.	Agricultural Assistant	Mr. Ramesh Chandar, M.Sc. (Agri.)	On deputation from Punjab Department of Agriculture (Temporary).		
127.	Technical Assistant	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Alam.	On deputation from Punjab Department of Agriculture.		
128.	Assistant Physiologist and Microscopist .	Mr. B. K. Kar, M.Sc. (Allahabad), Post-Graduate Scholar, U. P. Government.	On deputation from Punjab Department of Agriculture (Temporary).		
129.	Statistical Assistant	Mr. Bhagat Ram Sehgal, M.A. (Punjab) ..	Do.	do.	

(*ii*) *Entomological (Pink and Spotted Boll-worm) Scheme.*

130.	Assistant Cotton Entomologist.. ..	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).			—
131.	Field Assistant, Research Work ..	Mr. Ladha Ram, B.Sc.			—
132.	Field Assistant, Research Work ..	L. Ganda Ram, B.Sc., F.E.L.			—
133.	Field Assistant, Research Work ..	Mr. Nazir Ahmad, M.Sc.			—
134.	Field Assistant, Research Work ..	Mr. Manzoor Abbas, B.Sc. (Agri.)			—
135.	Field Assistant, Research Work ..	Mr. Ghulam Ullah, B.Sc. (Agri.)			—
136.	Field Assistant, Parasite Work.. ..	Mr. Piare Mohan, B.Sc. (Hons.), M.Sc. ..			—
137.	Agricultural Assistant	Mr. Mohammad Abdul Ghani.			—
138.	Statistical Assistant	Mr. Prithvi Nath, B.Sc. (Agri.)			—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*iii*) *White Fly Scheme.*

139.	Assistant Cotton Entomologist	L. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
140.	Field Assistant	Mr. Hari Chand, B.Sc. (Agri.)	——

(*iv*) *Root Rot Scheme.*

141.	Investigator	Dr. R. S. Vasudeva, B.Sc., Ph.D. (London), D.I.C. (London).	——

(*v*) *Survey of Disease of Malformation Scheme.*

142.	Agricultural Assistant	Bhai Bishan Singh, B.Sc. (Agri.)	——
143.	Agricultural Assistant	Bhai Santokh Singh, B.Sc. (Agri.)	Research Student, Indian Central Cotton Committee.

UNITED PROVINCES RESEARCH SCHEMES.

(*i*) *Entomological Scheme.*

144.	Special Research Assistant	Mr. H. D. Nangpal, M.Sc. (Hons. School) (Punjab). ..	Research Student, Indian Central Cotton Committee.

(*ii*) *Rohilkhand and Bundelkhand Survey Scheme.*

145.	Agricultural Inspector	Mr. Attar Singh, L.Ag. (Cawnpore)	On deputation from the United Provinces Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*contd.*

HYDERABAD RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

146.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab)..	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
147.	Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona)..	On deputation from Bombay Department of Agriculture.
148.	Assistant Cotton Research Botanist ..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.
149.	Inspector, Variety Testing Stations ..	Mr. N. R. Yardi, B.Ag. (Bombay)	——

(*ii*) *Cotton Survey Scheme.*

150.	Assistant Cotton Research Botanist ..	Mr. B. B. Mulchandani, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
151.	Second Assistant Botanist	Mr. M. A. Jaleel, B.Sc. (Agri.) (Coimbatore)..	——

(*iii*) *Hyderabad (Pink and Spotted Boll-worm) Scheme.*

152.	Senior Research Assistant	Mr. N. T. Nadkerny, B.Ag. (Bombay), Post-Graduate Course in Entomology at Poona Agricultural College.	——

HYDERABAD SEED DISTRIBUTION SCHEME.

153.	Inspector	Mr. M. V. Chitnis	——

BARODA ROOT ROT SCHEME.

154.	Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
155.	Mycological Assistant	Mr. G. H. Desai, B.Ag. (Bombay)	——
156.	Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1934—*concld.*

BIKANER GANG CANAL SCHEME.

157.	Cotton Assistant	Mr. V. N. Bhargave, B.Sc.	Research Student, Institute of Plant Industry, Indore.	

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

158.	Under Cotton Specialist, Coimbatore . .	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.	
159.	Under Cotton Breeder, Dharwar . .	Mr. H. R. Nayak, Inter Science (Madras) . .	Formerly Junior Tester at Technological Laboratory, Bombay.	
160.	Under Cotton Research Botanist, Lyallpur.	Dr. K. R. Sen, M.Sc. (Dacca), D.Sc. (Dacca). .	Research Student, Indian Central Cotton Committee.	
161.	Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) . .	Do.	do.

APPENDIX X.

RESEARCH STUDENTSHIPS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammed Afzal, B.Sc. (Punjab).	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Do.
,,	Jiwan Singh, M.Sc. (Punjab) .	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

6

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Sind Agricultural Department.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	....	Late Special Research Assistant, Pink Boll-worm Investigation, United Provinces.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology..	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding).	Punjab Agricultural Department, Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology .	Punjab Agricultural Department. Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
8 „	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology. .	....	Technological Assistant, Dharwar, up to 31st July 1929. Went abroad for further study.
„	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh.	Indian Central Cotton Committee.
„	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
„	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee. Obtained a Doctorate (D.Sc.) in 1934.
„	L. N. Rao, M.Sc. (Calcutta)..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay), M.Sc. (Tech.), (Manchester).	Do. ..	Cotton Technology. .	Head of the Textile Manufactures Department, Victoria Jubilee Technical Institute, Bombay.	Late Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.
„	Ram Saran Koshal, M.Sc. (Punjab).	Do. ..	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology..	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	Awarded a Training Grant for foreign study in 1933.
„	Karam Singh Lamba, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
„	Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Coimbatore.. ..	Cotton Bio-chemistry.	Chemist and Agronomist, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
„	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Sind Agricultural Department, Cotton Supervisor, Indus Right Bank, Sind Seed Distribution Scheme.	Do.
„	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Assistant Farm Superintendent, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Technological Assistant, Coimbatore.	Do.
„	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
„	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Secured Government Scholarship for study abroad and obtained Ph.D. (Cantab.).
„	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Do. ..	Assistant Professor of Zoology and Entomology, Agricultural College, Cawnpore.	Obtained Doctorate at Edinburgh.
„	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology..	Unemployed	....

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
	1927	Sant Singh Verma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	Abroad for further study..	Granted a Foreign Scholarship by the Indian Central Cotton Committee.
	„	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
	„	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Unemployed	....
	„	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....
	1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
	„	Piare Mohan, B.Sc., Honours School (Punjab), M.Sc.	Cawnpore	Cotton Entomology .	Field Assistant, Parasite Work, Pink and Spotted Boll-worm Scheme, Punjab.	Do.
5	„	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Junior Assistant, Sind Physiological Research Scheme.	Do.
	„	M. Kanti Raj, M.A., B.Sc. (Agri.) (University of Edinburgh).	Institute of Plant Industry, Indore.	Do. ..	Madras Agricultural Service.	....
	„	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology..	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
	1929	Srinagabhushana, B.Sc. ..	Do. ..	Do. ..	Technological Assistant, Surat.	Do.
3	„	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
	„	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do. ..	Do. ..	Do. ..	....

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1930	Madan Lal Bhatia, M.Sc. (Punjab).	Lyallpur	Entomology ..	Abroad for further study..	....
„	Bhola Nath, M.Sc. (Punjab)..	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Genetical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
„	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
„	Brajendra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	Unemployed ..	....
1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Do. ..	....	Resigned.
„	K. R. Dube, B.Ag. (Nagpur)..	Nagpur	Do. ..	Dist. Supervisor, Enquiry into the cost of production of Cotton and Sugar-cane crops, Central Provinces.	....
„	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Agricultural Assistant, Scheme for Survey of Disease of Malformation in Punjab-American Cotton.	Indian Central Cotton Committee.
„	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do. ..	Madras Agricultural Service.	....
		Foreign Research Studentships.			
1931	Sant Singh Verma, M.Sc. (Benares Hindu University).	Imperial College of Science and Technology, London.	Plant Physiology ..	Research Student	Under training.
		Training Grants.			
1933	S. N. Venkatramanan, B.A., B.Sc. (Agri.) (Madras).	Calcutta	Cotton Statistics ..	Research Student	Do.
„	C. Jagannatha Rao, B.A. (Madras).	....	Cotton Physiology..	Not yet joined	....

RESEARCH STUDENTSHIPS—*concld.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
		Foreign Training Grants.			
1933	M. Taskhir Ahmad, B.Sc. (Agri.) (Punjab).	Trinity College, Cambridge.	Entomology ..	Research Student	Under training.
2 „	G. B. Patel, B.Ag. (Bombay).	University of California, U.S.A.	Cotton Breeding ..	Do.	Do.
1934	M. A. Shama Iyengar, B.A. (Bombay).	Tour in Hungary, England and Egypt.	Study of Kalar (alkali) lands and cultivation of superior Egyptian cottons with special reference to soil and environmental conditions.	Do.	Do.
2 „	Nazir Ahmad, M.Sc. (Punjab).	Imperial College of Science and Technology, London.	Entomology ..	Do.	Do.

"Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants.

ANNUAL REPORT

OF THE

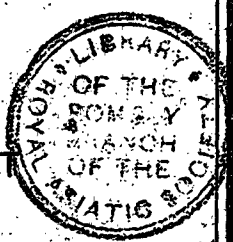
INDIAN CENTRAL COTTON COMMITTEE,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST

1935.



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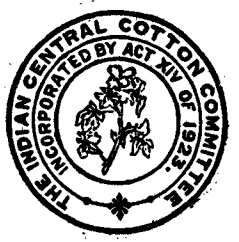

Indian Central Cotton Committee.

With the Secretary's Compliments.

Vulcan House, Nicol Road,
Ballard Estate,
Fort, Bombay.

ANNUAL REPORT

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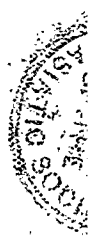

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Annual Report of the Indian Central Cotton Committee for the year ending 31st August 1935.

CHAPTER I.

As a result of one of the recommendations of the Indian Cotton Committee of 1918-19, the Indian Central Cotton Committee was constituted by the Government of India in the Department of Revenue and Agriculture in their Resolution No. 404-22, dated the 31st March 1935. Its functions were originally purely of an advisory character but with its incorporation in the Indian Cotton Cess Act in 1923, funds were made available " for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee's functions are thus dual in character. Firstly, it advises the Government of India and local Governments on subjects connected with the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention. Secondly, it provides funds for research into cotton problems of an all-India importance or for large areas where cotton is an important crop and for the extension and marketing of improved varieties of cotton. The research section of the Committee's work has passed the experimental stage, as will be seen in *Chapters IV* and *V* of this report.

The Committee further offers a common meeting ground for all branches of the cotton industry and all the main interests associated with cotton, *viz.*, the grower, the ginner, the exporter, the millowner and the agricultural expert, are represented on it; its primary concern, however, is the interest and welfare of the cotton grower.

PERSONNEL.

2. A list of members of the Committee as it stood on the 31st August 1935 is given in *Appendix I.* Under the Indian Cotton Cess Rules, members, who are not *ex-officio* members, hold office for three years and one-third of their number retire each year in rotation.

At its meeting in August 1935, the Committee recorded its appreciation of the work of its President, Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., on the eve of his retirement, in the following Resolution :—

> **" The Indian Central Cotton Committee places on record, at this the last meeting of the Committee at which Sir T. Vijayaraghavacharya presides, the uniformly, able and efficient manner in which Sir T. Vijayaraghavacharya presided over the Committee for six years. His consistent courtesy to each member and his unrivalled tact and patience in dealing with the various questions that were dealt with by the Committee have been an asset to the Committee.**

The Committee records its best thanks to Sir T. Vijayaraghavacharya for the continued close attention he gave to details of the question disposed off during this period and it tenders him its best wishes on the eve of his retirement."

SUB-COMMITTEES.

3. Most of the detailed work of the Committee is carried on by means of Sub-Committees and thereby much of its time is saved at its half-yearly meetings. The Committee is greatly indebted to the members of these Sub-Committees for the invaluable assistance they have given in furthering the work of the Committee and whilst it would be invidious to single out any for special mention, it feels that it would be lacking in a sense of appreciation if it did not record its express thanks to the members of the Standing Finance and Local Sub-Committees who by reason of the nature of the work transacted by these Sub-Committees are called upon to attend meetings at much more frequent intervals than is the case with members of the other Sub-Committees.

The functions of the various Sub-Committees are detailed below and their composition as on the 31st August 1935 will be found in *Appendix II.*

(*a*) *The Standing Finance Sub-Committee* is a statutory Sub-Committee and is the principal executive body of the Committee. By Resolution of the Committee one of the members of this Sub-Committee must be a representative of the cotton growers. Seven meetings of the Sub-Committee were held during the year.

(*b*) *The Local Sub-Committee* which met seven times in the year under report deals with all matters of a general nature, not involving finance, which cannot be postponed for consideration to the half-yearly meetings of the full Committee.

(*c*) *The Cotton Ginning and Pressing Factories Sub-Committee* is also a statutory body appointed to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. It did not meet during the year.

(*d*) *The Agricultural Research Sub-Committee* ordinarily assembles half-yearly during the meetings of the full Committee, reports on the progress made on schemes financed by the Committee, examines proposals for new schemes or extensions of those already in operation and considers the reports of research students.

(*e*) *The Technological Research Sub-Committee,* like the Agricultural Research Sub-Committee, generally meets during the half-yearly meetings of the Indian Central Cotton Committee and considers all matters connected with the Technological Laboratory and Technological Research.

(*f*) *The Research Students Selection Sub-Committee,* as its name implies, selects students to whom scholarships or training grants are awarded for the purpose of undergoing training in research in the several sciences pertaining to cotton. One meeting of this Sub-Committee took place during the year.

(*g*) *The Sub-Committee on Malpractices* was formed in order to deal with all references concerning malpractices and abuses which adversely affect Indian cotton. There were no matters during the year which necessitated a meeting of this Sub-Committee being called.

(*h*) *The Forecast Improvement Sub-Committee* usually meets half-yearly, its principal business being the improvement of the cotton forecasts of India.

(*i*) *The Special Sub-Committee on Wider Markets* which met twice during the year was appointed in August 1933 with the object of examining the question of finding wider markets for Indian cotton.

(*j*) *The Standards Sub-Committee* is concerned with the preparation for use in India of universal standards of certain growths of cotton dealt with in common both by the East India Cotton Association and the Karachi Cotton Association and of certain other varieties with which only the former Association is concerned. This Sub-Committee which was constituted in April 1933 met five times in the year under report.

In addition to the above Standing Sub-Committees, Special Sub-Committees are appointed from time to time to deal with specific matters which do not fall within the purview of any of the other Sub-Committees.

4. Whilst the Committee is representative of practically all sections of the cotton trade in India, it also enjoys the privilege of deputing representatives to serve on other bodies. Thus Sardar Rao Bahadur Bhimbhai Ranchodji Naik represents the Committee on the Imperial Council of Agricultural Research, and on the Board of Directors of the East India Cotton Association the Committee is represented by three members, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. N. M. Deshmukh and Mian Nurullah, being its nominees in the cotton year 1934-35. On the Joint Sub-Committee of the Imperial Council of Agricultural Research and of the Committee in connection with the investigation into the cost of growing cotton, sugar-cane and their rotation crops, the Committee is represented by Sir Purshotamdas Thakurdas, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. Chimanlal G. Parekh, (representative of the East India Cotton Association) and the Secretary. Its representatives on the Institute of Plant Industry, Indore, are the President, (Dewan Bahadur Sir T. Vijayaraghavacharya), Vice-President, (Sir Purshotamdas Thakurdas), Mr. Chunilal B. Mehta, Mr. Kasturbhai Lalbhai, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. S. D. Saklatvala, Mr. J. Vonesch, Mr. G. C. R. Coleridge, Rao Bahadur G. R. Kothare, Mian Nurullah, Dr. W. Burns and the Secretary.

In response to an invitation from the International Federation of Master Cotton Spinners' and Manufacturers' Associations, the Committee appointed Dr. W. Burns and Mr. W. J. Jenkins, both members of the Committee, as its representatives to the International Cotton Congress which was held at Milan and Rome from the 29th April to the 4th May 1935. Only Dr. Burns, however, was able to attend.

MEETINGS.

5. The Indian Central Cotton Committee held two meetings during the year under review, both at Bombay. The first meeting took place on the 4th and 5th February 1935, Mr. H. C. Short, Commissioner in India, Lancashire Indian Cotton Committee, attending it as a visitor.

The second meeting, which was held on the 19th and 20th August 1935, was honoured by the presence of His Excellency the Right Honourable Michael Herbert Rudolf Knatchbull, Lord Brabourne, G.C.I.E., M.C., Governor of Bombay. Amongst the other visitors present were the Hon'ble Dewan Bahadur S. T. Kambli, J.P., Minister for Education, Government of Bombay, the Hon'ble Khan Bahadur D. B. Cooper, Member for Revenue and Finance, Government of Bombay, Mr. Kasturbhai Lalbhai, Pankore's Naka, Ahmedabad, and Mr. M. D. Williams of the British Cotton Growing Association (Punjab), Ltd., Khanewal.

A list of the more important resolutions passed at these two meetings will be found in *Appendix III*.

STAFF.

6. Mr. P. H. Rama Reddi held charge of the office of Secretary throughout the year.

The post of Deputy Secretary remained vacant.

Dr. Nazir Ahmad held the post of Director, Technological Laboratory, during the year, and Mr. R. D. Mihra that of Publicity Officer.

A temporary gazetted post of Personal Assistant to the Secretary was created for a period of one year in the first instance and Mr. C. J. Bocarro, the Office Superintendent, was appointed to it.

The office staff continued to give its loyal co-operation, and I wish to record once again my appreciation of their help during the year.

PROVINCIAL COTTON COMMITTEES.

7. The value of provincial cotton committees in dealing with problems of provincial importance has been emphasised in previous reports and it is gratifying to note that where such provincial committees have been functioning the work done by them has been of appreciable assistance to the Committee in arriving at decisions when the subjects dealt with by them have been referred to it. The Committee is not always in a position to visualise local problems in their true perspective and therefore the discussions and decisions of provincial cotton committees go a far way towards overcoming this handicap. During the year under review, the Sind Cotton Committee met twice and the Punjab and Central Provinces Cotton Committees once each and much useful work was transacted by them. It is hoped that the current year will see a revival of the activities of the other provincial cotton committees.

CHAPTER II.

WORK OF THE YEAR.

COTTON POLICY.

8. THE year under review saw the completion of the Committee's investigations into the possibilities of growing long and medium staple cottons in the present short staple cotton areas of India. This investigation was the immediate result of the threatened Japanese boycott of Indian cotton in 1933 which brought home the risks India ran in producing large quantities of short staple cotton which had only a limited market. After an exhaustive survey of the prevailing conditions of each cotton tract in India, with particular reference to the quality of the cottons grown, the factors limiting the growth of superior varieties, and the characteristics of the cottons considered suitable for these tracts, the Committee came to the conclusion that for the Surti, Broach, Kumpta-Dharwar, Raichur, Tinnevellies, Cambodia, Gaorani, and Central Provinces and Berar areas, and the American tracts of the Punjab and Sind, suitable long or medium staple varieties were already on hand. In the Khandesh, Salems, Westerns and Northerns, Cocanadas, Hyderabad Oomras and Malvi tracts types of cotton superior to the existing inferior local mixtures have been isolated or experiments were under way with a view to evolving superior types of cotton suitable for these tracts. For the rest of the cotton-growing areas of India medium or long staple cottons suitable for each tract have not yet been obtained but trials with some of the superior strains grown in other tracts with similar climatic and soil conditions may prove successful in some of them. A solution of the problem confronting the successful growing of medium and long staple cottons in the Northerns and Westerns tract may lie in the investigation into dry cultivation whilst a study of Persian cottons might solve the problem of the Dholleras tract. In the United Provinces the eradication of the pink boll-worm seems to be the first step required to be taken before any attempt is made to improve the quality of the cotton.

COMPACT BLOCK OF LONG STAPLE COTTON IN SIND.

9. THE Government of Bombay have, by resolution, signified their approval of the Committee's recommendation regarding the establishment of a compact block of long staple cotton of 300,000 acres in Sind and have expressed their agreement with the conclusion arrived at by the Chief Agricultural Officer in Sind that the area south of the Jodhpur Railway is the most suitable for such a purpose. The Local Government are not, however, in favour of immediate legislation to prevent the growing of short staple cotton in the proposed block as suggested by the Committee as they consider that the end in view can be achieved by other measures such as the licensing of gins and presses, the use of special marks in licensed factories, seed supply organisation and organised

marketing. Whilst expressing its appreciation of the action taken by the Bombay Government, the Committee at its meeting held on the 19th August 1935 urged upon them the desirability of introducing such legislation as might be considered necessary to achieve the desired object if the measures contemplated by them proved inadequate, and also drew their attention to the serious danger to which the better quality cottons, capable of spinning 30's counts and over, grown in the proposed compact block were exposed by admixture not only with *Desi* but also *4-F* American cotton which is suitable for 20's counts only. To obviate this danger it has been recommended to the Local Government that the proposed compact block should be reserved for growing only the pure types of long staple cotton distributed by the Agricultural Department and that the Cotton Transport Act should be applied to it to prevent the importation of *kapas* from outside the area for purposes of mixing.

Morning Broadcast of Cotton Prices.

10. The Committee made a strong representation to the Government of India to revive the system of broadcasting in the early morning the commercial news pertaining to cotton, particularly through the Bombay broadcasting station. In making this recommendation the Committee felt that the early morning broadcast of cotton prices was of considerable benefit not only to merchants and big cotton growers, some of whom had specially installed receiving sets in order to get this information, but also to the agriculturist generally who often took great pains to ascertain the latest rates coming through the radio before he sold his cotton. In some villages cut off from telegraphic communication, the villagers had even raised subscriptions for the purpose of installing receiving sets. Furthermore, by the discontinuance of the early morning broadcast of cotton news, up-country cotton markets also were greatly handicapped, as the fixing of daily prices by them depended much on the information received regarding prevailing prices in New York, Liverpool and Bombay. The matter is still under the consideration of the Government of India.

Spread of Garrow-Hill Cotton in the Central Provinces.

11. The rapid spread in the Central Provinces of Garrow-Hill cotton, a very inferior short staple variety so harsh as to be good only for mixing with wool, is another matter which engaged the attention of the Committee. This cotton is of late rapidly spreading and its mixing with the superior cotton of the tract has the effect of lowering the prices of the latter. The extension of this cotton is thus highly detrimental to the interests of the growers of superior cotton of the tract. The Committee therefore fully endorsed the views of the Central Provinces Provincial Cotton Committee that immediate steps should be taken by the Central Provinces Government to eradicate this cotton from the Central Provinces and Berar and that the steps proposed by them to prevent the mixing of different varieties of cotton were quite inadequate. It accordingly recommended that nothing short of a complete prohibition of the growing and handling of Garrow-Hill cotton in the Central Provinces and Berar would be effective.

LANCASHIRE INDIAN COTTON COMMITTEE.

12. IN February last the Lancashire Indian Cotton Committee published its first Annual Report and in forwarding copies of it for circulation to members of the Indian Central Cotton Committee expressed the hope that the report would be found to be an acceptable effort on the part of that Committee to broaden and strengthen co-operation between India and the United Kingdom. Several members commented favourably on the report and considered it to be a valuable record of what was being done by the Lancashire Committee to popularise the use of Indian cottons in the United Kingdom. The Committee at its meeting in August 1935 passed a unanimous resolution appreciating the efforts made by the Lancashire Indian Cotton Committee to extend the use of Indian cotton in Lancashire and assuring that Committee of its desire to co-operate to the fullest extent possible in matters affecting the interests of both bodies. According to the Liverpool Cotton Association Weekly Circulars, the total takings of Indian cotton by the United Kingdom during the last three years were :—

	Season.	*Season.*	*Season.*
	Bales.	Bales.	Bales.
	1934-35	1933-34	1932-33
Total ..	393,784	361,546	229,740

THE COTTON TRANSPORT ACT.

13. AT the request of the Indian Central Cotton Committee the Government of India, in 1923, passed the Cotton Transport Act which enables local Governments to prohibit the import of cotton into any area within their jurisdiction. The Act was devised to prevent the import, for mixing and substitution, of inferior cotton into areas growing superior varieties.

Madras.—There was no change in the protected areas in the Madras Presidency.

Bombay.—The seven protected areas notified in the Bombay Presidency remained unchanged during the year under report. The Committee approved of a proposal of the Director of Agriculture, Bombay Presidency, to fix the Mahi River as the northern boundary of the Nerbudda-Mahi protected area and the subject is under the consideration of the Local Government.

Central Provinces.—The application of the Act was extended during the year to include the Nimar and Hoshangabad districts (excluding the Narsinghpur Sub-Division) in the protected area with a view to prevent the import of *Bengals* cotton into these districts for the purpose of mixing.

Indian States.—No change was made in the protected areas in Hyderabad, Baroda, Indore, Rajpipla and Chhota Udepur States. Sangli continued with the Bombay Rules, which were introduced in the State from the 1st July 1930,

THE COTTON GINNING AND PRESSING FACTORIES ACT.

14. Over a dozen cases of infringements of the Act were reported during the year to the authorities concerned. In some either the wrong year or indecipherable or incorrect marks were put on bales and in others, press marks were absent. In almost all cases warnings were given to the factory-owners. Where it was found that breaches were due to misunderstanding on the part of the factory-owners instructions as to the proper method of marking were issued to them and they were directed to be more careful in future. In one instance where the use of unauthorised weights was detected in a ginning and pressing factory and the only action taken was a severe warning to the factory-owner by the Collector of the District, the attention of the Local Government concerned was drawn to the leniency of the punishment and they were requested to instruct trying officers to take a serious view of such offences and to inflict adequate punishment in future.

In December 1934, the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester, requested the Committee to press the Government of India for the re-imposition of the rule requiring press marks to be indelibly stamped on the hoops of cotton bales, the reason stated being that the hessian covering of bales often got damaged or was cut out during sampling, thus making it impossible for the bales to be identified. The original rule requiring press marks to be stamped on the hoop was amended by the Government of India at the request of the Committee on the representation of the East India Cotton Association who drew attention to cases of hardship and losses incurred by Bombay merchants because of bales being rejected in arbitration for minor faults in marking. The method of marking prescribed in the original rule was so meticulous that the East India Cotton Association arbitrators has no option but to reject such bales as were not marked strictly in accordance with the rule, although the bales rejected were in all other respects a fair tender and even at times carried " ON " allowances. For these reasons the Committee was unable to accede to the request of the International Federation.

It is gratifying to note that on the whole the marking of bales in Indian States has proceeded satisfactorily. Legislation for this purpose and for the submission of weekly press returns is now in force in the following States :—

Alipura, Alwar, Bahawalpur, Baroda, Barwani, Bhavnagar, Bhopal, Bikaner, Bundi, Cambay, Chhota-Udepur, Cutch, Datia, Dewas (Junior), Dhar, Dhrangadhra, Faridkot, Gondal, Gwalior, Holkar State (Indore), Hyderabad (the Nizam's Dominions), Idar, Jaipur, Jamkhandi, Jaora, Jasdan, Jhabua, Jhalawar, Jind, Jodhpur, Junagadh, Katosan, Kishangarh, Kolhapur, Kotah, Lakhtar, Limbdi, Malerkotla, Manavadar, Mewar, Miraj (Senior), Morvi, Mudhol, Muli, Mysore, Nabha, Narsingarh, Nawanagar, Palitana, Patiala, Porbandar, Radhanpur, Rajkot, Rajpipla, Rutlam, Sachin, Sangli, Sardargarh, Savanur, Sayala, Shahpura, Tonk, Wadhwan, Wankaner, and Western India States Agency.

Weekly returns for cotton pressed were received from all the above States during the year, except Gwalior.

LICENSING OF GINNING AND PRESSING FACTORIES.

15. Mention was made in last year's report of the request of the Committee to the Government of India for the amendment of the Cotton Ginning and Pressing Factories Act by the addition of a clause empowering local Governments to introduce the system of licensing ginning and pressing factories with the consent of their respective legislative councils. Such a measure, it was hoped, would provide an effective remedy for the various malpractices which were lowering the reputation of Indian cotton both in the country and abroad. The Government of India have since intimated their inability to undertake central legislation as desired by the Committee but they have no objection to local Governments introducing such legislation in their own councils. The Bombay and Central Provinces Governments are taking steps to enact the necessary legislation and it is hoped that when the beneficial results of the action taken by these Governments become apparent, other Provinces and States will not be slow in following suit. At present only the Hyderabad State has legislation of this character in force.

MALPRACTICES.

16. The East India Cotton Association reported five cases of bales having been rejected as they contained watered cotton. These bales came from Hansi and Mandi Dabwali in the Punjab, Shegaon and Telhara in Berar and Navsari in the Bombay Presidency. Certified copies of entries in the press register pertaining to the bales in question were called for under Section 3 (3) of the Cotton Ginning and Pressing Factories Act and the information supplied was communicated to the East India Cotton Association.

An exporting firm in Karachi reported the rejection in Liverpool of bales of saw-ginned Punjab-American cotton due to some of the bales having been badly damaged internally by water. A report was made to the Director of Agriculture, Punjab, who brought the complaint to the notice of the factory-owners concerned and intimated to them that such malpractices brought a bad name on the cotton of the tract and adversely affected the trade and that such practices should be avoided in future.

A complaint regarding oil spots in cotton from Bhatinda (Patiala State) received from a Bombay firm late in 1933 was reported to the Patiala State authorities. Intimation has now been received that instructions have been issued by the authorities to the effect that a warning should be administered to the factory-owner.

A complaint received towards the end of 1933 from an exporting firm in Karachi, regarding false packing and adulteration in bales received from Dhuri (Patiala) was reported to the State authorities who recently intimated that a warning had been given to the press concerned.

On receipt of information last year from a cotton exporting firm that as a result of cut-throat competition factory-owners, to reduce their losses, resorted to the malpractice of mixing seed with cotton at certain places in the Central

Provinces and in Central India, reports were made to the Director of Industries Central Provinces,and the Holkar State authorities for such action as they might consider feasible. In the Central Provinces, Commissioners and Deputy Commissioners instructed their subordinates to advise cotton traders and press-owners of the evils of such practices. The Holkar State authorities propose to check the malpractices complained of by utilising the penal provisions in the Holkar State Ginning and Pressing Factories Act whenever glaring cases capable of easy proof are noticed. Under these provisions the mixing of cotton with seed or other trash can be punished with fine extending to Rs. 2,000 or even by the cancellation of licenses for working the factory. The State also propose to carry on propaganda against such practices through the medium of cotton markets.

A complaint regarding the presence of abnormal quantities of seed in cotton from the Hyderabad State was received from a Bombay exporting firm and reported to the State authorities. This led to the issue of a circular to all ginning factories by the State drawing their attention to the serious consequences which such practices were likely to have on the prices of cotton in the tracts concerned and emphasising the necessity of their discontinuance. Factory-owners were also warned that action would be taken against them involving the cancellation of the licenses if excessive seed was found in cotton ginned by them.

Reports were also received during the year that Rajputana cottons were being imported by rail into Central India and the Nimar and Hoshangabad districts of the Central Provinces for the purpose of being mixed with the superior cottons grown in these tracts. On information being sent to the Central Provinces Government, prompt action was taken to apply to the two districts concerned the provisions of the Cotton Transport Act whereby no cotton could be imported into the districts except under license. The question of moving the concerned States in Central India to introduce legislation on the lines of the Cotton Transport Act is engaging attention.

Persistent complaints regarding the presence of admixtures of seed and impurities in full pressed bales from various places in the Punjab and Patiala State has led to the suggestion being made that the Karachi Cotton Association should report the names of the presses complained against to the Association members and to this Committee. The Karachi Cotton Association has decided in the meanwhile, as an alternative, to write, on receipt of complaints, friendly letters to the factories concerned drawing their attention to the faults complained of, impressing upon them the desirability of marketing cotton pure and pointing out the embarrassment to which the factories would be exposed if the complaints were sent round to all local buyers.

BOMBAY COTTON CONTROL BILL.

17. The attention of the Bombay Government having been drawn by the Committee to the danger to which the high grade *1027 A.L.F.* cotton grown in the Surat protected areas was exposed by admixture for purposes of illicit

gain with a low type of cotton having high ginning percentage known as "*Goghari*" grown in the same area, the Local Government have decided to introduce a Bill to prohibit the cultivation, mixing or possession of this cotton in such tracts as may be notified by them. With slight modifications the Bill follows a similar piece of legislation in the Madras Presidency, which is directed against another type of inferior cotton known as "*Pulichai.*" The Committee is convinced that unless legislation of the type contemplated is taken *Goghari* cotton will spread rapidly in the Surat tract and ruin the reputation of *1027 A.L.F.* cotton to the detriment of the cotton growers of the tract affected.

Cotton Markets.

18. The establishment of regulated cotton markets under the Bombay Cotton Markets Act has not been proceeding as rapidly as was hoped though the advantages of such markets to growers are generally recognised. So far only three markets, one each at Dhulia, Amalner and Bail Hongal, have been notified under the Act. There appears to be some demand for regulated cotton markets at Malegaon, Baramati and Dharwar and the question of opening similar markets at Surat, Broach and Bijapur is also receiving the attention of the Commissioners concerned.

District Local Boards and big *zamindars* in Sind do not appear to be aware of the advantages of regulated markets and propaganda to convince local opinion of the desirability of such markets would, therefore, seem to be necessary. It has accordingly been suggested that an experimental cotton market should be established at a suitable centre either by Government or by co-operative agency in order to educate growers and to demonstrate the detailed working of a regulated cotton market.

The Madras Government have finally published the Rules under the Madras Commercial Crops Markets Act and it will be interesting to see what measure of success attends this piece of legislation in that Presidency in so far as cotton markets are concerned compared with the Bombay Presidency and the Central Provinces.

The question of undertaking legislation for the establishment of cotton markets in the Punjab has also been engaging the attention of the Local Government and the conclusion arrived at was that the problems of marketing required much closer study before the Local Government could attempt to embark on legislation. An enquiry undertaken there revealed the existence of many evils the remedy for which, the Local Government consider, lay rather in the force of an enlightened and active public opinion than in the enactment of legislation.

It is unfortunate that owing to protests on the part of the commercial community, the Sangli State Commercial Crops Bill which was passed by the State Assembly could not be passed into law. The previous Huzur Order regulating the sale and purchase of commercial crops continues therefore to remain in force.

In the Baroda State, rules under the Baroda Agricultural Produce Markets Act to which reference was made in last year's report have not yet been finally framed.

Universal Standards for Indian Cottons in India.

19. In accordance with the procedure detailed in last year's report, the Standards Sub-Committee passed the standards for the following varieties of cotton :—

Bengals.	*Oomras.*
Sind.	*Mathias.*
Punjab-American.	*Broach.*
Sind-American.	*Dholleras.*

The reference set of standard boxes intended for the Committee were, after being placed in hermetically sealed cases, sent to Bangalore for storage.

Standardisation of Weights in Cotton Transactions.

20. Last year's report contained the information that only the United Provinces and the Central Provinces Governments had accepted in full the Committee's recommendation suggesting the adoption of the railway *maund* of 82⅔ lb. and the *khandy* of 784 lb. as units of weights for cotton transactions, and that the Bombay and Punjab Governments had prescribed only the railway *maund* of 82⅔ lb. and the Madras Government the *khandy* of 784 lb. The Bombay Government were again requested to reconsider the question of standardising the Bombay *khandy* of 784 lb. but they expressed their inability to accept the Committee's recommendation owing to the divergence of views expressed by the various important commercial bodies consulted. They added, however, that the regulations in force in the Presidency did not debar cotton transactions in *khandies* of 784 lb. provided they complied with the provisions of the Bombay Weights and Measures Act by specifying in addition the exact equivalent of *khandies* in one or other of the standard weights, *viz.*, lb., quarters, cwts., etc.

Of the five principal cotton growing States addressed in this matter, Gwalior has adopted the *maund* of 82⅔ lb. and the *khandy* of 784 lb. and Baroda the *maund* of 82⅔ lb. In Indore the *maund* of 82⅔ lb. is the standard and legal weight, all other weights being unauthorised. The Hyderabad and Mysore States are still considering the question.

Representation on the International Federation of Master Cotton Spinners' and Manufacturers' Associations.

21. In order to deal more effectively with complaints arising abroad regarding faults, often of a minor nature, in Indian cotton which frequently received wide publicity through the publication of the proceedings of the bodies at which they were discussed, the Committee considered it desirable to obtain,

if possible, representation on the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester. It is understood, however, that under the Federation's constitution, the Committee is not entitled to ordinary membership and an application has accordingly been made for admission as an Associate Member. The result* is awaited.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

22. *The Mexican Boll-weevil* (*Anthonomus grandis*).—The restrictions imposed by the Government of India in 1925 on the import of American cotton into India continued in force, without change, during the year under review. American cotton can be imported into India only through the port of Bombay and that, too, only after fumigation with hydrocyanic acid gas. Imports of American cotton rose to 63,171 bales during the season as against 22,499 bales in the previous year. A rebate of fumigation fees at the rate of 8 annas per square bale and 5 annas per round bale on all American cotton fumigated during the year ending 31st March 1934 was sanctioned by the Government of India and paid to importers in April and May 1935.

23. *The Red* (*Sudan*) *Boll-worm* (*Diparopsis castanea*) *and other pests.*—The restrictions placed on the import of foreign cotton seed under Government of India Notification No. 1213 Agri., dated the 27th May 1930, in the Department of Education, Health and Lands, and the entire prohibition of the import of foreign *kapas* (unginned cotton) under Government of India Notification No. 897 Agri., dated the 24th July 1925, remained in force throughout the year. Under these regulations two parcels of cotton seed were received for examination and fumigation during the year.

COLLECTION AND SUPPLY OF INFORMATION.

24. As in the past, notes† on the progress made in the Provinces and Indian States in the introduction of improved varieties of cotton, and on the work of the Committee were contributed to the Bombay Cotton Annual published by the East India Cotton Association.

PUBLICITY AND PROPAGANDA.

25. A full account of the activities of the Publicity and Propaganda Department of the Committee will be found in the Annual Report of the Publicity Officer which forms *Chapter VII* of this Report.

The most important event of the year was the campaign conducted by the Publicity Officer for the extension of control measures against the pink boll-worm in the United Provinces. This campaign had for its object the focussing of public attention on the necessity of tackling the pink boll-worm evil and the advantages to be derived from its control. At the same time an enquiry was carried out in connection with the question of levying a cess to meet the cost

* Information has since been received that the Committee has been admitted to Associate Membership.

† Appendix V.

of the required heating machines, their installation, working expenses, etc., should it be decided to introduce control measures. A specially designed 10-colour poster was used with much advantage during the campaign.

Seven press communiqués were issued, four of which dealt with the development of cotton growing in Sind, the Bombay Presidency, the Central Provinces and the Coimbatore District of the Madras Presidency.

In addition to the issue of special articles and pamphlets from time to time, the Department participated in the exhibitions at Nanded organised by the Agricultural Department of Hyderabad State, the All-India Exhibition, Lahore, and the Kolhapur Fair. Publicity and Propaganda material for use at the Memorial Exhibition at Formosa (Japan) was also supplied at the request of the Agent, the Japan Cotton Spinners' Association, Bombay.

PUBLICATIONS.

26. The Committee receives partly on an exchange basis and partly by subscription a number of important scientific and technical journals which are circulated to research workers and institutions of the Committee. This arrangement is not only more economical in as much as it obviates the duplication of journals and periodicals purchased out of the Committee's funds for the various schemes but at the same time affords all workers an opportunity of perusing varied and up to date scientific literature, which might not otherwise be available to them.

The name of the Committee is on the free mailing list of a number of private and public institutions to whom the thanks of the Committee are due. Particular mention should be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, the Empire Cotton Growing Corporation, the British Cotton Growing Association, the East India Cotton Association and the Karachi Cotton Association for the supply of their publications for distribution to members. The Committee further records its thanks to the Indian Trade Commissioner, London, the U.S.A. Department of Agriculture, the Egyptian Ministry of Agriculture, Technical and Scientific Service, the Liverpool Cotton Association, the Lancashire Indian Cotton Committee, the Imperial Bureau of Plant Genetics, Cambridge, the Textile Institute, Manchester, the Imperial Institute, London, the Indian Statistical Institute, Calcutta, the National Institute of Sciences, Calcutta, the Academy of Science and other Associations and Chambers of Commerce which supply it with reports, statistics and other literature from time to time. The Committee is also on the free exchange list of the Imperial Council of Agricultural Research, the Imperial Institute of Agricultural Research, Pusa, and the Director-General of Commercial Intelligence and Statistics, Calcutta.

SECRETARY'S TOURS.

27. During the year under review the Secretary visited Simla, Indore (twice), Lyallpur, Lahore, Madras, Coimbatore, Perindurai, Bangalore, Irwin Canal Farm, and Hyderabad in connection with the work of the Committee.

FINANCIAL.

28. In *Appendix VI* will be found a statement showing the Receipts and Expenditure of the Committee and also the Balance Sheet for the year ending 31st March 1935. Receipts amounted to Rs. 8,73,983 and expenditure to Rs. 9,71,623. The estimated expenditure for the year was Rs. 13,57,585, the principal items of savings being under the following heads :—

Administration (Rs. 28,063), Improvement of Cotton Marketing (Rs. 12,584), Seed Distribution and Extension Schemes (Rs. 1,06,575—three schemes sanctioned were held in abeyance), Printing and Propaganda (Rs. 11,046), Technological Research (Rs. 83,540), Surat Boll-worm Clean-up Scheme (Rs. 7,960), Broach Cotton Breeding (Rs. 4,716), Defibration of cotton seed, Bombay Presidency (Rs. 2,000), Madras Pempheres and Physiological (Rs. 21,626), Punjab Botanical (Rs. 32,509), Punjab Entomological (Rs. 8,910), Punjab White Fly (Rs. 3,170), Punjab Physiological (Rs. 15,264), Punjab Spraying Trials (Rs. 2,736), Central Provinces Botanical (Rs. 2,836), Sind Physiological (Rs. 5,705), Hyderabad Botanical (Rs. 1,185), Hyderabad Pink and Spotted Boll-worm (Rs. 4,135), Bikaner Gang Canal (Rs. 4,527), Baroda Root Rot (Rs. 2,557) and Bengal Comilla (Rs. 2,196).

At the suggestion of the Government of India that the Committee should consider the desirability of maintaining a minimum balance from its accumulated funds, it was decided to fix the minimum balance at Rs. 9 lakhs subject to the condition that there should be no objection to drawing on this balance in case of emergency, provided that such shortages are made good as soon as conditions improve.

CHAPTER III.

STATISTICS.

29. FROM its very inception fourteen years ago the Committee has evinced considerable interest in the subject of cotton statistics and this interest has been shown not only in the direction of attempting to improve as far as possible, the accuracy and form of presentation of the statistics previously available, but also in that of introducing new statistics for various phases of the cotton industry information about which was lacking. In the following paragraphs the further progress registered, or work done during the year under review alone is recorded, as space does not permit the recapitulation of past history.

30. *Cotton Crop Estimates.*—The arrangement under which the Director-General of Commercial Intelligence and Statistics, Calcutta, telegraphs cotton crop estimates to the Secretary, Indian Central Cotton Committee, for their simultaneous release at Bombay and Calcutta, worked satisfactorily during the year under report.

These estimates showed a fall in the area of cotton in India from 24,136,000 acres in 1933-34 to 23,830,000 acres in 1934-35. The decrease was due to the unfavourable weather conditions prevailing at sowing time in Hyderabad State, which alone registered a fall in area of over half a million acres. The total estimated yield for the season was 4,807,000 bales of 400 lb. as compared with 5,068,000 bales of 400 lb. during the preceding season, and the average yield per acre was 81 lb. as against 84 lb. in 1933-34. Unfavourable weather conditions, especially the cold spell and frost in January reduced the yield of the crop.

An interesting point is brought out in the area figures for each variety of cotton reported during the last five seasons. Though it cannot be said that there has been any steady decline or increase in area in the case of all other varieties for which separate figures are reported, it is noteworthy that the area under Cambodia has steadily risen from 2.5 lakh acres in 1930-31 to the record figure of 5 lakh acres in the last season. *Cambodia* is, like *Surat-Navsari*, *Kumpta* and *Hyderabad Gaorani*, one of the very best cottons of the peninsula, almost wholly consumed in India and rarely exported.

31. The piece-meal publication of Provincial and State cotton forecasts had been a source of misunderstanding to the Trade, especially in the forecasted yield of crops like Broach, the estimates for which are contained partly in the Bombay forecasts and partly in the Baroda forecasts. The recent decision of the Government of India to withhold the publication of the individual forecasts until after the publication of the all-India forecasts, is therefore a welcome feature. The revival from August 1935 of the system of publishing all-India forecasts in leaflet form is also a great convenience to the Trade, as it dispenses with the necessity of purchasing copies of the more costly Indian Trade Journal for the sake of forecasts.

32. The scheme for the improvement of the cotton crop forecasts of the Bombay Presidency, sanctioned by the Committee in January 1934 for a period of two years in the first instance at an estimated total cost of Rs. 11,694, completed its first year on the 15th June 1935. The investigations brought to light several sources of error in the compilation of Bombay cotton forecasts. It is particularly noteworthy that a very serious mistake, which regularly swelled the estimated yield of an Indian State by a lakh of bales was discovered and rectified during the year. In addition, the district standard yield figures which, for want of crop-cutting experiments, had not been revised for many years were examined in the light of other available statistics, and tentative revised yield figures adopted for West and East Khandesh districts, and Belgaum, Bijapur and Dharwar districts. Further work is in progress. In the meantime, in view of the importance of the question of improving the accuracy of cotton forecasts, the Committee decided that the First Progress Report of the scheme should be brought to the notice of the Government of India.

33. Reference was made in last year's report to the efforts made by the Committee to obtain by local enquiries reliable estimates for the quantity of raw cotton annually used in India for such domestic purposes as hand-spinning and the making of quilts, mattresses, cordage, etc. The respective reports, except Hyderabad, submitted on the completion of these enquiries, were examined by the Cotton Forecast Improvement Sub-Committee at its meeting held in August 1935. As the enquiry made in Bengal had failed to furnish the data necessary to arrive at a standard for village consumption in the non-cotton growing tracts of Bengal and Bihar, the Committee deemed it advisable to conduct another enquiry in Bihar and sanctioned a sum of Rs. 1,200 for this purpose.

34. It is highly gratifying to note that on the whole the subject of the improvement of the accuracy of Government cotton forecasts is receiving increasing attention at the hands of the authorities concerned, to whom an opportunity of meeting and discussing their problems is afforded by the half-yearly meetings of the Cotton Forecast Improvement Sub-Committee. As the result of an investigation into the repeated under-estimation of the Sind crop, the standard yield figures of Sind have been revised tentatively. Similar action taken with regard to certain districts in the Bombay Presidency proper has already been referred to. In British Punjab, crop-cutting experiments are under way on a more extensive scale than before. Failing to get from the Punjab States an adequate response to the suggestion made to them for revising their estimates of yield, it has been decided to make use of the figures for cotton pressed for the purpose of estimating the crop of such States. The Central Provinces and Berar have advanced a step further in the collection of complete and reliable statistics to check the accuracy of their forecasts. Arrangements have been made from the commencement of the season 1935-36 to obtain from factories a weekly statement showing the quantity of cotton ginned together with information regarding its origin. Likewise monthly returns have now been arranged for, from every custom station on the borders of Hyderabad State, with a view to finding out the

quantities of *kapas*, unpressed cotton, and pressed cotton, that are exported from each district in the State to each of the adjoining British districts. The question of the revision of the standard yield figures of Mysore State is also being examined by the Revenue Commissioner of the State.

35. As in the previous year, a report on the estimated production, during the season, of Indian cotton of different staples, was issued in May. With the ungrudging co-operation of the Agricultural Departments it was possible to give in this report more detailed information than had been possible before. Not only were the chief fibre characteristics of the different growths given but also the civil districts in which they were grown were specified. The criticisms received on this report show that the attempt is being appreciated by the trade and industry though the report is likely to be more useful to them by the introduction of a few more innovations in it. One suggestion received and already accepted by the Committee is that trade estimates of the crop should be given side by side with the Government estimates and an attempt will be made to give effect to this suggestion in the report to be published in May 1936, although owing to the dissimilar bases on which the two estimates are prepared the likelihood of reconciliation would appear to be somewhat remote.

36. *Press Statistics.*—Ever since the passing of the Cotton Ginning and Pressing Factories Act in 1925, all cotton presses in British India have been furnishing weekly returns of cotton pressed in them and these have been duly collated by provincial authorities and forwarded to the Director-General of Commercial Intelligence and Statistics for publication. It was soon realised, however, that unless similar statistics were obtained from Indian States it would be impossible to arrive at any correct estimate of the cotton crop of India and accordingly efforts were made early to enlist the co-operation of Indian States The problem presented considerable difficulties as no less than sixty-five States had to be individually approached for necessary legislation providing, *inter alia*, for the establishment of press statistics. The Committee is gratified to be able to report now that its efforts have not been in vain and that all States addressed have fallen into line with British India in this matter, the last of them—Gwalior—having signified its intention of compiling press returns from the current season.

The returns of cotton pressed during the season 1934-35 show that 3,444,781 bales were pressed in British India and 1,169,820 bales in Indian States, making a total of 4,614,601 bales for the whole of India, the corresponding figures for the preceding season being 4,045,516 bales, 1,286,317 bales and 5,331,833 bales respectively.

37. *Loose (unpressed) Cotton Statistics.*—Unlike the U.S.A. cotton ginnings are not reported in India, and the lack of this information leaves a big gap in the statistical information on the Indian cotton crop. This gap can, however, only be bridged if the press statistics referred to in the preceding paragraph are supplemented with information regarding the quantities of loose cotton (ginned but unpressed) taken directly into mills or used for

domestic consumption or for exports. In 1925, the Committee therefore brought to the notice of provincial authorities in the Punjab, the United Provinces, the Central Provinces and Berar, and Bombay the desirability of collecting these statistics from mills on a voluntary basis. They readily agreed and the figures relating to loose cotton received at mills in the major cotton growing provinces of British India are being compiled and published since 1926 (*vide Appendix VII*). It will be seen from these figures that mills situated in cotton growing tracts take considerable quantities of raw cotton in loose unpressed form.

In view, however, of the fact that the information now available is not complete even for the provinces for which they are collected, the Committee at its meeting held in August 1935 decided to recommend to the Government of India to amend the Rules under the Indian Cotton Cess Act by providing for the desired information to be shown in the monthly returns furnished by mills under the Act. Should the proposal be accepted, it is hoped that, with the co-operation of Indian States, the necessary figures would, before long, be available for the whole of India.

38. *Consumption.*—The compilation and publication of the monthly statements* (1) of Indian cotton consumed in British Indian mills, (2) of Indian cotton consumed in mills in Indian States, and (3) a consolidated statement of (1) and (2) specially meant for publication in the daily Press were continued. For the first time in the history of the Indian mill industry, the consumption of Indian cotton in India exceeded the limit of 2½ million bales and registered the record consumption of 2,612,132 bales against the previous record of 2,373,094 bales in 1929-30. Much of this rise is due to the substantial recovery of Bombay Island which is by far the largest consuming centre of Indian cotton.

The world's total consumption of Indian cotton, too, increased from 4,772,000 bales in the previous year to 5,599,000 bales in the year ending 31st July 1935.

39. *Exports.*—The exports of Indian cotton during the season 1934-35 were 3,115,420 bales of 400 lb. as compared with 3,269,000 bales in the previous year.

40. *Stocks.*—Accurate and reliable information regarding the stocks of raw cotton left in the country at the end of each season is as important to the cotton trade as it is to those on whom falls the task of checking forecasted production of raw cotton with the actuals accounted for at the close of the season. Except for the stocks held by the trade and the mills in Bombay this information had been lacking till 1933, when the Committee took this matter up and set to work to enlist the co-operation of various trade bodies, mills and cotton market committees in collecting the desired information. In the short period that has elapsed since this question was first taken up, a considerable

* Appendix VII.

part of the field has been covered, and it is hoped that, with an increasing appreciation of the usefulness of these statistics they will in due course be made more reliable and complete.

The information collected with regard to the stocks held on the 31st August 1935 is contained in *Appendix VIII.*

It may be mentioned here that for the very late crops, *viz.*, Salems, Cambodias and Tinnevellies of the Madras Presidency, the season for which is taken to be the year ending 31st January, the Director of Agriculture, Madras, has made arrangements to collect every year the stocks held on the 31st January, by the trade in their respective tracts, and by mills in the whole of the Presidency. The first set of figures collected under this arrangement is given in *Appendix VIII.*

41. *Demand for various types of Indian cotton.*—Another useful line of enquiry undertaken by the Committee is the Indian mill and export demand for the various types of Indian cotton. In the changing conditions of the world, the importance of obtaining a clear idea of the nature and extent of the demand for each type of cotton, and of the variations in this demand from year to year cannot be overemphasised.

The Statistical Leaflets Nos. 3 and 4 (second issues) giving the results of the inquiry into exports and receipts at mills in 1934-35 are reproduced in *Appendices IX* and *X.*

41A. *Publications.*—The following publications were issued during the year under report :—

(1) *Statistical Leaflet No.* 1 (*Second Issue*)—" Report on the Staple Length of the Indian Cotton Crop of 1934-35 Season".

(2) *Statistical Leaflet No.* 2—" Stocks of Indian Raw Cotton held in India by the Mills and the Trade on 31st August 1934".

(3) *Statistical Leaflet No.* 3—" Receipts at Mills in India of Raw Cotton classified by Varieties—1933-34 Season".

(4) *Statistical Leaflet No.* 4—" Exports by Sea of Indian Raw Cotton classified by Varieties—1933-34 Season".

(5) *Statistical Bulletin No.* 4—" Supply and Distribution of the Various Types of Indian cotton during the season of 1933-34".

The last publication is an attempt, the first of its kind ever made to examine the supply and distribution of the various types of Indian cotton from the material provided by the first named four publications. Thanks are due to the Vice-President, Sir Purshotamdas Thakurdas, who kindly examined the draft of this bulletin and contributed a foreword to it.

CHAPTER IV.

RESEARCH.

42. WITH the passing of the Cotton Cess Act in 1923, the Indian Central Cotton Committee was provided with funds for "the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee carries out these objects by the establishment and direct control of the Technological Laboratory at Matunga, Bombay, and by offering subsidies to Departments of Agriculture and Co-operative Sale Societies in provinces and States for the investigation of some specific problems of economic importance and for the extension and marketing of improved types of cotton produced either by Departments of Agriculture or by the research financed by the Committee. In addition the Committee contributes annually a large sum of money to the Institute of Plant Industry, Indore, which is a central research station for cotton in the black cotton soils of Central India; The problems dealt with in provinces and States include many research schemes of more than local importance, *viz.*, botanical for obtaining improved types of cotton by selection and hybridisation, physiological for the investigation of crop growth, bud and boll shedding and periodic failure of American cotton in the Punjab, mycological to provide measures against wilt and root rot and entomological for the study of the life history of cotton pests and measures to eradicate them. The Committee has also undertaken jointly with the Imperial Council of Agricultural Research the economic enquiry into the cost of the cultivation of cotton, sugar-cane and their rotation crops in the principal cotton and sugar-cane growing areas of India. All research and seed extension and marketing schemes are, as they are received from the Directors of Agricultural Departments, first examined and approved by the Agricultural Research Sub-Committee before they are finally sanctioned by the Committee which keeps itself in close touch with the progress of their work by means of annual reports submitted by officers in charge. Technological problems are similarly dealt with by the Technological Research Sub-Committee before they are approved by the Committee. The Committee provided funds during the year ending with the 31st March 1935, amounting to Rs. 6,44,006 for research and seed distribution and marketing schemes in addition to the sum of Rs. 4,92,328 sanctioned to the Technological Laboratory, Matunga, the Institute of Plant Industry, Indore, and the economic enquiry into the cost of the cultivation of cotton, sugar-cane and their rotation crops. The Committee also offers scholarships and training grants for post-graduate training in India and abroad in subjects pertaining to cotton industry.

TECHNOLOGICAL LABORATORY.

43. The Annual Report of the Director, Technological Laboratory, forms Chapter VI of this report and it may be referred to for details. The work of the Laboratory, particularly of the spinning and yarn testing sections,

suffered to some extent during the year owing to the necessity of slowing down the processing of samples for over six weeks in order to allow the extensions to the spinning and yarn testing block and the replacement of some of the old blow-room machines with new up-to-date machines. This accounts for the decline in the number of samples and lots spun during the year as compared with last year. The samples tested during the year fell, as usual, under four classes, *viz.*, (*a*) agricultural samples, (*b*) samples of standard Indian cottons, (*c*) Trade samples and (*d*) Technological samples. The agricultural samples represent mostly new strains which are still in experimental stage and some old types grown in connection with certain field experiments undertaken by agricultural officers in provinces and States. Of these experiments special mention might be made of the tests on *38F*, *43F*, *Boss III* and *Sea Island* cottons and on the effect of differential irrigation upon the fibre properties and spinning quality of cotton. The standard cottons consist of certain improved varieties which are now being grown on 15 per cent. of the total area under cotton cultivation in India. They include *Umri Bani*, *Verum 262* (Nagpur), *Verum 262* (Akola), *Punjab-American 289F*, *Punjab-American 4F*, *Jayawant* (Kumpta), *Surat 1027 A.L.F.*, *Gadag* 1 (Dharwar-American), *Cambodia Co. 2*, *Sind Sudhar*, *Sind N. R.*, *V. 434*, and *Late Verum*, and the results of the first nine types were published during the year in four-page circulars. The trade samples represent (*a*) the main types of commercial cotton which form the bulk of the Indian cotton crop and (*b*) the first arrivals of the new crop of cotton of a season. The object of these tests is to supply first hand information to the trade and mill industry regarding the waste losses and the spinning quality of these cottons. During the year under report 25 samples for the trade and 20 samples for the industry were tested and the results were published in 2-3 page circulars as usual. In addition to these tests the Laboratory undertakes on payment of certain fees laid down by the Committee tests on samples supplied by individual mills and firms in their private capacity and 39 such samples were received and reported upon during the year. The experiment started during the last year at the instance of the trade for finding out the effect of artificial watering on the spinning quality of Amraoti and Broach cottons was continued. The tests on Amraoti cotton were completed during the year and those on Broach cotton are in progress. With regard to the investigation into the effect of different degrees of compression on the spinning quality of long staple cotton, bales pressed to the same size but weighing approximately 400 lb., 300 lb. and 200 lb. of *289F*, *1027 A.L.F.*, *Jayawant* and *Cambodia* have been purchased and the necessary tests will be commenced in due course. The enquiry into the effect of storage of cottons in open plinths and in sheds at Karachi was completed and the results show that cotton stored in the open definitely suffered both in grade and spinning quality. The technological samples comprise the samples spun in connection with certain research problems. The problems undertaken during the year include the limit spinning tests, high draft tests, effect of balanced and unbalanced drafts on mixings, effects of storage on seed cotton prior to ginning, combing of good quality Indian cottons and comparative tests on the effect of change in the blow-room machinery.

The moisture testing section continued the tests on the moisture content of Indian cotton received in Bombay and in view of the adequate data obtained on these tests during the past three years a final report containing all the results was written up and submitted to the East India Cotton Association.

INSTITUTE OF PLANT INDUSTRY, INDORE.

44. The Annual Report for 1934-35 of the Director, Institute of Plant Industry, Indore, will be found in *Appendix IV* which may be referred to for the details of work carried out during the year. The institute was opened in 1924 with a view to providing a central research station for cotton in the black soils area of Malwa plateau and it is maintained by grants contributed by the Indian Central Cotton Committee and some of the States in Central India and Rajputana. The programme of the Institute includes the general botany, physiology and genetics of cotton in addition to a number of agricultural investigations relating to the cultivation of cotton and other crops. As decided last year, a beginning was made for the general distribution of the two new types of *desi* cotton, *Malvi 1* and *Malvi 9*, which have been found to yield 20 per cent. more than the local mixture. *Malvi* 9, the better of the two, is superior to local by 4 to 6 per cent. in ginning and about 40 per cent. in spinning. It has also been discovered in the course of the study of genetic variance in cottons that further improvement is possible in both *Malvi 1* and *Malvi 9* and that the latter is capable of greater improvement. *Cambodia*, as compared with *desi* has been found a poor yielder on all soils in Central India with the possible exception of a few areas under tank irrigation and it does not therefore appear to have any future in Malwa unless it fetches a premium of 50 per cent. Experiments have been laid out for definitely ascertaining whether *Upland* American can hold its own against *Desi* in Malwa and, if so, by what means. The data obtained from the botanical survey of cottons in Malwa and Nimar reveal very interesting and important differences in survival value of different types and physiological work is being undertaken to find out the causes of the differences in plant response. The study of hybrids between *G. Africanum* and cultivated Asiatic cottons has shown that the normal chromosome compliment of all plants so far studied is 26 but a few plants contain small 'islands' of tetraploid tissue. Root studies on wilt have confirmed the indications obtained last year that the presence of fungus need not necessarily lead to death or even to wilting and that on the other hand wilting followed by death might occur even when no fungus could be found. The moisture contents of the soil around wilted plants, particularly in the first one foot below the surface, have been found higher than around healthy plants. This is evidently due to the change in the physical condition of soil brought about by affected plants and the influence of this change on the aeration and activity of roots is obvious. The application of organic and inorganic manures and the dressings of substances calculated to improve the physical texture of soil have given different degrees of virulence ; nitrogen and phosphate seem to encourage wilt very considerably.

GRANTS-IN-AID.

SCHEMES IN PROGRESS IN PROVINCES AND STATES.

MADRAS PRESIDENCY.

45. *The Herbaceum Scheme* was first started in 1923 with the object of securing from local *Uppam* (*G. herbaceum*) suitable types equal to *Karunganni* (*G. indicum*) in yield and spinning quality when grown under usual rain-fed conditions in Salem and Coimbatore districts where rainfall is low and often precarious. In years of good rainfall *Karunganni* gives a much higher yield than *Uppam* while in bad years the position is reversed, *Uppam* being a hardier variety, capable of giving a fair yield even in adverse seasons. The cultivator meets the situation by growing a mixture of the two varieties. The *Karunganni* strains which are being distributed by the Agricultural Department are capable of spinning up to 26's warp counts against about 14's of *Uppam*. It was, however, realised after seven years' hard work that the chances of obtaining pure strains from *Uppam* that could spin above 20's were few and it was therefore decided in 1930 to secure by hybridisation what was found impracticable by pure line selection. The new line of work has now given some valuable results which are likely to prove to be of considerable economic importance. Two of the selections, *viz.*, 4714 and 4801, from a cross between *indicum*, *cernuum* and *obtusifolium* have not only proved to be pure for seed and lint characters but have given in comparative tests much better yields than all other strains with which they were compared. Selection *4714*, the better of the two, has given an increase of 75 per cent. over the control, *Karunganni 2622*, and has also beaten by 20 per cent. *Karunganni 546* which has been leading in yield ever since its inclusion in comparative tests. It seems also to possess drought resistance comparable with *Uppam*. It has a lint length of 26 mm. and ginning outturn of 29 per cent. and its spinning value has been estimated at 28's. This selection might be said to have fulfilled the object, provided it behaves in years of good rains in the same way as it did this year of insufficient rainfall. A few inter-varietal and inter-specific crosses have been back-crossed to both the parental types with a view to exploit the new technique of back-crossing. Some of the plants grown of X-rayed *Uppam* seed have developed some interesting peculiarities which will be studied next year.

46. *Pempheres and Physiological Scheme.*—The main object of this scheme when it was sanctioned in 1925 was (*a*) to devise measures for the control of the cotton borer (*Pempheres affinis*), (*b*) to investigate bio-chemically the causes of the susceptibility of cotton plants to this insect and (*c*) to continue the work on bud and boll shedding which had already been started by the Cotton Specialist at Coimbatore. But due to the difficulty of securing the services of a competent plant physiologist the scheme had to be held in abeyance till 1930 when it was decided that two officers from the Madras Agricultural Department should be sent to England for special training in plant physiology and bio-chemistry in order that they might, on their return after training, occupy the posts of Physiological Botanist and Bio-Chemist under the scheme and that pending their return a beginning might be made with the preliminary

work under the supervision of the Cotton Specialist. The scheme commenced formally in September 1931 when Messrs. T. R. Narayana Iyer and S. Kasinatha Iyer were sent for training in plant physiology and bio-chemistry respectively. On their return after training the scheme was reviewed in February 1935 when it was decided to restrict its scope to the reduction of the shedding of flowers, buds and bolls in *Karunganni* caused by untimely rains, by breeding and physiological methods and devising control measures against the cotton stem borer. From the investigations carried out in 1933-34 it was noticed that the actual loss due to pempheres was only 4 per cent., but the results obtained from the repetition of the same experiment during the year under report show that assuming the incidence of attack as 100 per cent., the loss sustained in yield amounts to nearly 50 per cent. — 20 per cent. due to the death and the rest to the poor yield of affected plants. The eight American varieties, *Gadag, Bourbon, Co. 2, Buganda, 9355, Durango, Buri* and *U. 4.* which were tested during the year were found equally susceptible to the attack though they slightly differed in their resistance. A few crosses between *Co. 2* and some South American types which were found resistant to the attack have been re-crossed with *Co. 2* with a view to obtaining resistant types. On bio-chemical side, the regeneration of the tissue of the affected plant is confined only to a third of the larval gallery and is not begun till the pest is at least a fortnight old. It is, however, interesting to note that Peruvian cotton gums up so rapidly after the attack that insects responsible for the damage die out quickly. Three parasites, a Braconoid and two kinds of Chalcids, were observed attacking the borer in its grub stage but their damage did not exceed 1 per cent. The incidence of the pest was found considerably low in localities where the close period of cotton is longer than three months and also when sowings were put off by about three weeks in September the crop was free from the pest till January, showing thereby that the pest could be easily brought under control if no cotton plants are left in fields for over three months between the harvest of the old crop and the sowing of the next crop of cotton. The preliminary investigations into the shedding of flowers, buds and bolls indicate that boll retention is higher in *Karunganni* types than in *Uppam* and that cotton when mixed with black gram has less shedding than when it was sown pure.

47. *The Fodder Cholam Scheme* commenced in January 1931 with a view to ascertain the causes of the harmful effects of *cholam* (*Andropogon sorghum*) as compared with *Cumbu* (*Pennisetum typhoideum*) on the succeeding crop of cotton in the Tinnevelly district and to find out suitable remedial measures. The work of the year under report was more or less a repetition of what had been done in previous years except that two new experiments were added for the study of base exchange in soils and the effects of the application of compost and that a few experiments which had given definite results were omitted. The weather conditions were unfortunately so abnormal that with the exception of the one experiment on base exchange no other experiment gave any decisive result though the general trend was in the direction already indicated in previous years. The study of base exchange shows that while there is little difference between *Cholam* and *Cumbu* soils in the first layer

of six inches, the second and third six inch layers of *cholam* soils contain a much greater amount of sodium ion and a little less of magnesium than in the corresponding layers of *Cumbu* soils. This difference is probably responsible for the deflocculated condition and reduced permeability of *cholam* soils as already noticed, and a knowledge of the processes which bring out this change may prove very helpful in devising suitable ameliorative measures. *Cholam* does not appear to exhaust the soil fertility any more than *Cumbu* and neither deep ploughing nor the application of humus in the shape of sunhemp compost had any effect on *cholam* soils as could be seen from the low yields of succeeding cotton. The conclusion arrived at in previous years that, while *cholam*, when allowed to run into seed, seriously affected the yield of succeeding cotton, no such adverse effect was observed when it was cut at shot blade stage was once again confirmed. Attempts are being made to find a way to obtain a large yield of *cholam* fodder when cut at shot blade stage by sowing fodder late in the season when there is not enough moisture in the soil to keep the plants growing, by thick sowing, by growing a mixture of *cholam* and one or more suitable pulse crops, by preventing *Cholam* plants from running into seed by cutting ear heads at the flowering stage and other means.

48. *The Nadam Cotton Breeding Scheme,* which commenced in February 1933, has for its object the selection of suitable annual types of cotton to replace perennial *Nadam* (*G. obtusifolium*) in the red soil tracts of Salem and Coimbatore districts where due to the poverty of soil and precarious rainfall neither *Karunganni* (*G. indicum*) nor *Uppam* (*G. herbaceum*) grows satisfactorily. *Nadam* being a perennial cotton, provides a convenient breeding ground for the stem-weevil and pink boll-worm during the close period of *Cambodia* prescribed by the Madras Pest Act and if an annual variety suitable for these tracts is secured, it will be possible to extend the Pest Act all over Salem and Coimbatore districts without exception and thus avoid damage to *Cambodia* cotton. The work of the year under report shows that there is a good prospect of securing an annual type which can replace *Nadam.* The season was very unfavourable with a low rainfall of 21 inches against an average of 30 inches. Sowings had to be delayed till the third week of October for want of timely rains and the total rainfall received throughout the growing period of cotton was only 4·35 inches. Even under these adverse conditions, three cultures of *Nadam,* nine of F *3* crosses of *Nadam* and *Karunganni* and thirty F *3* and F *4* crosses of *Cambodia* and *U 4* were expected to yield about 200 lb. of *kapas* per acre against about 80 lb. of *Nadam* in the second year when highest yield of this cotton is usually expected. A large number of plants have also been selected for earliness from F *2* cross of *Co. 2* × *U. 4* and from a back cross of (*Nadam* × *Karunganni*) × *Karunganni* and from various varieties sown in bulk.

BOMBAY PRESIDENCY.

49. *Broach Cotton Breeding Scheme.*—The chief aim of this scheme which was started in April 1932 is to obtain for Nerbudda-Mahi zone suitable types of cotton with wilt-resistant, heavy yielding, high ginning (40% and above) and superior spinning qualities to replace the local mixture which consists of a large percentage of *Goghari,* a rough and short staple variety susceptible to wilt but

with a high ginning outturn up to 40 per cent. In view, however, of the recent change in the Committee's policy to replace, wherever possible, short staple cotton with medium and long staple varieties, efforts are now concentrated only on wilt resistance, heavy yield and fibre length. During the year under report four crosses, *viz.*, (1) *B. D. 8 x G. A. 26* (fourth generation), (2) *B. D. 8 x G. A. 26-F1* back crossed to *B. D. 8* (second generation,) (3) *B. D. 8 x S-7-1* (second generation) and (4) *B. D. 8 x S.12-1* (first generation), were studied in detail. Of the 66 families belonging to cross No. 1, two were found entirely free from wilt, seven with 1 to 5 per cent. attack and in the rest the attack varied from 6 to 60 per cent; 76 wilt-resistant plants with 35 and above ginning percentage and 20 to 23 m.m. fibre length have been selected for further examination in 1935-36. Cross No. 2 appears to be more vigorous and prolific than a simple cross between *B. D. 8* and *G. A. 26* and from the 15 cultures of this cross which were examined during the year, 66 plants with 35 to 42 per cent. ginning outturn and fibre length of 20 to 23 m.m. have been retained for further tests. Cross No. 3 is a little susceptible to wilt but has good staple and medium ginning outturn. Forty-three plants of this cross with 35 and above ginning percentage and staple length of 20 to 23 m.m. have been selected for further study next year. Cross No. 4 resembles *B. D. 8* a long staple variety with low ginning percentage, in height, vigour and staple length and *S-12-1* in fruiting and bearing. Its ginning outturn is midway between the two parents. Fresh crosses have been made between (i) *B.D.8* and *1027 A.L.F.* and (ii) *B.D.8* and *N.S.12.* Of the single line selections, *N.S. 12* has again proved satisfactory for wilt-resistance and other economic characters.

50. *The Jalgaon Cotton Breeding Scheme,* like the Broach scheme, was started in April 1932 with the object of securing by selection or hybridisation wilt-resistant, heavy yielding, high ginning and fine spinning types of cotton to replace local *N.R.* and *Banilla,* a cross between *Bani* and *Comilla* in Khandesh. *Banilla,* though only equal in yield, is superior to local *N.R.* in ginning outturn and spinning quality. It is, however, susceptible to wilt and has considerably deteriorated in spinning quality from the time it was first introduced. The three selections, *viz., N.V. 57-7, N.V. 56-3,* and *N.V. 56-17,* which looked promising last year, were again found this year better yielders than *Banilla* and *N.R. 6* and did not suffer from the bad effects of continuous rains after sowing. They are also wilt-resistant and much superior to *Banilla* in fibre length. One of them, *N.V. 57-7,* is typically sympodial and matures earlier than the other two selections but it is slightly inferior in ginning percentage.

51. *The Scheme for Survey of Goghari Cotton in Gujerat* is a necessary corollary to the Committee's policy of encouraging exclusively the cultivation of *1027 A.L.F.* in the tract lying south of the Nerbudda in Gujerat and to the seed scheme sanctioned in August 1934 for the extension of this cotton. The scheme has for its object the field survey of *Goghari,* an inferior short staple variety, with a view to trace it to ginneries and induce them to discourage its cultivation by refusing to pay high price for it. Frost damage during the year made the survey difficult but the results obtained nevertheless indicate the wide distribution of *Goghari* either as pure or mixed crop. Gin-owners failed

to co-operate with the Department of Agriculture and it is intended to approach them once again next year through the Gujerat Divisional Cotton Committee and the East India Cotton Association, Bombay.

52. *Plant Puller Propaganda Scheme in Surat and Broach Districts.*—This scheme is the natural consequence of the Surat Boll-worm Clean-up Scheme which was sanctioned in December 1930 for the purpose of demonstrating to the cultivator in Gujerat the advantages of uprooting cotton stalks and stubbles before the end of May and thus depriving the pink and spotted boll-worm of the food material till the next crop of cotton. The clean-up scheme was quite a success as it clearly demonstrated that by clean-up measures the cultivator could obtain 25 to 30 per cent. more yield and on the termination of this scheme in April 1934, the Committee sanctioned in the first instance for one season of four months the plant puller scheme with the object of popularising the cotton plant puller, a cheap and effective implement, for uprooting cotton plants. The plant puller propaganda was continued during the year by means of public lectures, magic lantern shows and practical demonstrations and as a result of this activity the Department of Agriculture could distribute in the North of the Nerbudda 1,282 plant pullers in addition to another 2,158 pullers sold by local merchants. In the south of the Nerbudda the demand for plant pullers was much greater and the Department of Agriculture could not obtain for this tract more than 1,536 pullers which were disposed of very quickly. The total area cleared is estimated at 80 per cent. in Broach, 90 per cent. in Amod, 75 per cent. in Wagra and 40 per cent. in Jambusar Talukas in the north of the Nerbudda and 22 per cent. of the total area under cotton in the south of the Nerbudda. A considerable area was thus left untouched due mainly to the new leases being delayed so late in the season that the incoming tenants has no time to pull out cotton stalks in time. To avoid this difficulty it is hoped that by the time the scheme terminates in June 1936 the Government of Bombay would pass necessary legislation on the lines of the Madras Pest Act to enforce the uprooting of cotton stalks every year before the prescribed date.

53. *The Scheme for Defibration of Cotton Seed* was sanctioned in August 1934. A defibration machine has since been purchased and installed at Palej, Broach district, and the machine will commence work in January 1936.

SIND.

54. *Sind Physiological Research Scheme.*—The main object of the scheme is to ascertain the optimum sowing time and irrigation and manurial requirements of cotton in the Barrage areas of Sind and it commenced work in July 1927. The work of the year under report is mainly a repetition of what was done during the last year and the results obtained are in conformity with those of previous years. The irrigation experiments show once again that the water requirements of cotton are the highest during the flowering and fruiting periods and that an initial irrigation of 8 inches during the 1st 28 days followed in order by two irrigations of 2.75″ each at 20 days' interval, three irrigations of 2.75″ each at 15 days' interval and 5 irrigations of 2.75″ each of 10 days'

interval gives the highest yield. The manurial experiments also have given again best results when, in addition to the initial application of compost before sowing at the rate of 7½ cart loads per acre, ammonium sulphate was applied at the rate of 100 lb. per acre either in one dose when the crop is 3½ months old or in two equal doses, one when the crop is 1½ months old and the second two months later. Observations on ' red leaf ' were continued. The experiments for finding out the optimum time for sowing were not repeated in view of the definite conclusions already arrived at.

PUNJAB.

55. *Botanical Scheme.*—The chief object of this scheme when it was sanctioned in 1925 was to investigate into the causes of the periodic failures of American cotton in the Canal Colonies where a very large area is annually under this cotton and to obtain suitable types of American and *Desi* cottons to replace *4F* and *desi* cottons respectively. Efforts are, however, being concentrated from the beginning on the problem of breeding new types in view of their immediate economic importance and as will be seen below a separate Physiological Scheme has since been started for the enquiry of periodic failures. Mention was made in last year's report that after extensive tests of *36F*, *38F*, *43F*, *45F* and *47F* strains under different conditions of soil and climate, the Department of Agriculture had decided to continue for one more year comparative tests between *43F* and *38F*, the two most outstanding strains, with a view to select one of them finally for general distribution in the province. They were accordingly tested during the year and the final choice fell on *43F*, an early and jassid resistant type with $1\frac{1}{16}$" staple length and capable of spinning up to 44's. *38F* is slightly inferior to *43F* in staple length and is also susceptible to jassid attack. It may, however, prove useful in drier parts of the province. Three other American strains, *54F*, *55F* and *58F*, have given promising results and they will be tested extensively in 1935-36. The *desi* type No. 39 which was issued last year for distribution has been spreading satisfactorily and two other *desi* strains are under severe tests.

56. *The Physiological Scheme*, as mentioned above, was sanctioned in August 1933 for the purpose of ascertaining the causes of the periodic partial failure of American cotton in the Punjab and it commenced work in March 1935.

57. *Pink and Spotted Boll-worm Scheme.*—In January 1926, the Committee sanctioned a Pink Boll-worm Scheme for the investigation of the causes responsible for the difference in the incidence of the pink boll-worm between South-East Punjab where its attack is severe and the Canal Colonies where it is negligible. The scheme came to an end in March 1934 when it was superseded by the present Pink and Spotted Boll-worm Scheme for the continuation of the work on pink boll-worm and the enquiry of certain aspects of the spotted boll-worm. The results obtained from the Pink Boll-worm Scheme have been given in previous reports and it will be seen from them that temperature and humidity are the main causes of the unequal distribution of the insect in the two areas. The work of the year indicates that the attack of the spotted

boll-worm is more severe in the Canal Colonies and Western Punjab than in the rest of the province where the pink boll-worm predominates. During the year under report the spotted boll-worm made its first appearance in the middle of June when the new crop was a few weeks old and continued boring the tender shoots till about the beginning of September when it commenced attacking flower buds and green bolls. Its damage, as was observed from the experiments of night caging, amounted to 47 per cent in the case of *4F* and 65 per cent in the case of *desi*. The degree of attack varied with the types of cotton and the time of sowing. In the Punjab there is a close period of cotton over four months during which interval the spotted boll-worm lives on cotton sproutings from last year's stumps and on the host plants like *Malva Sylvestris Abutilon indicum, Malva parviflora, Althearosea, Hibiscus esculentis* (*Bhindi*), etc. It is, however, interesting that for about six weeks of this period the only host plants available are the sprouts of cotton stumps and by removing them in time it may be possible to control the pest effectively. It is therefore proposed to start soon clean-up experiments over an area of not less than 150 square miles on the lines conducted in the Surat tract of the Bombay Presidency. Five parasites of the spotted boll-worm, *viz., Microbracon lefroyi, Malcha nursei, Rhogus testaccous, Elasmus sp.* and *Chalies trachardiace,* were observed at Rhotak and Lyallpur and from the data collected it is noticed that a temperature in the neighbourhood of 82°F is optimum for the increase of *M. lefroyi* while above 95°F and below 55°F no development of the insect takes place. The duration of the total life cycle of this parasite which attacks both spotted and pink boll-worms varies from 7 to 51 days. Work on the other four parasites is in progress.

58. *White Fly Scheme.*—White Fly (*Bemesia gossypiperda*) is a small sucking insect that does damage to cotton and other crops and was first observed at the British Cotton Growing Association's estate, Khanewal. In 1929 one of the Committee's scholars was deputed to study the insect and in 1930 the Committee felt convinced of the necessity of a more thorough investigation and sanctioned the White Fly Scheme which commenced in May 1931. During the year under report the white fly infestation was unusually low. As in previous years the attack was more severe on *desi* cotton than on American types till about the end of August when it decreased on all varieties. The pest, however, continued till about the end of the season, but from September onwards it was relatively more on two of the American varieties, *4F* and *L.S.S.* than on *Mollisoni* (*desi*) and other American types tested, *viz., 289F, 38F* and *43F*. During the period of severe infestation the vegetative growth of the crop was considerably affected and even stopped entirely in extreme cases, but when the infestation was removed either by natural means or by spraying, the crop appeared to recover more or less completely. It was, however, noticed that though the plants subjected to severe attack for one month in July and kept free before and after this period, seemed to suffer minimum damage they gave only 50 per cent of normal yield. Similarly when plants were infested for one month in August they gave very poor or minimum yield. Similar infestations for one month from the middle of July and from the middle of August gave the lowest ginning percentage and the lowest seed weight

respectively. The infestation was the lowest when the soil was treated with iron sulphate, but this treatment decreased, irrespective of the degree of attack, boll formation and ginning percentage and increased flower and boll shedding. Infestation was comparatively higher when sodium nitrate and ammonium sulphate were applied as manure but they gave good boll formation, higher ginning percentage and low shedding. They had also very beneficial effect on yield when they were applied to poor soils towards the end of June and to rich soils in the latter half of August. No relation seems to exist between the degree of infestation and the percentage of water content in the leaf except that *Mollisoni*, which contains the least amount of moisture, suffered the most. Irrigation experiments have, however, confirmed the previous indication that the attack is more or less in inverse proportion to the quantity of water applied to the crop. Observations were continued on the incidence of the pest on different host plants during the different parts of the year and the data obtained confirm the results of the last year.

59. *The Punjab Spraying Trials Scheme* is the outcome of the White Fly Scheme which has given a definite indication of the efficacy of certain insecticides against the white fly pest without causing any material damage to the cotton crop. The results of sprayings on small areas were misleading as the insect could fly to the sprayed plants from the surrounding unsprayed areas and it was therefore considered necessary to test on a large scale the indications obtained from the investigations of the White Fly Scheme. The present scheme was accordingly started in July 1933 with the object of ascertaining (*a*) the most suitable and economic insecticide and the proper time for spraying or dusting and (*b*) the various methods and appliances for spraying and dusting the field crop of cotton. The results obtained in 1933-34 in regard to the cost of spraying rosin compound and rosin soap with Sapom sprayer, Hardie power sprayer and Orchard power sprayer and the percentage of mortality of the pest with each of these insecticides and sprayers have been given in last year's report. The trials were repeated during the year under report over an area of 2,640 acres at Khanewal, Okara and Sargodha. The results were again quite satisfactory with regard to the mortality of the insect. They also indicate that spraying is a profitable concern if it is done in proper time and that the number of spraying is not as important as the time of spraying. The trials will once again be repeated in a year of bad white fly attack.

60. *Root Rot Scheme.*—This scheme which commenced in September 1932 has for its object the investigation of root rot in the Punjab where its annual damage to the cotton crop is estimated at Rs. 1,600,000. Both *desi* and American varieties are equally susceptible to this disease which is rapidly spreading in all irrigated areas of the Punjab and contrary to the indications obtained last year the incidence of the disease on irrigated cotton does not appear to have any relation to the number of irrigations. The disease appears to be less severe on cotton sown in the middle of June than on cotton sown earlier and neither *desi* nor American varieties suffered much when they were grown under rain-fed conditions. Root Rot, as explained in previous reports, is caused by two species of Rhizoctonia. Their attack is more virulent when

they act together than when only either of them is present and their activity is increased by the presence of subsidiary fungi (*Fusarium sp. Helminthosporium sp. Alternaria sp.*) though they are by themselves harmless. The two causal organisms are most active at 35°C and their parasitic activity declines with the fall in temperature. The thermal death point of both the resisting bodies and mycelia of the two organisms is also about the same. The disease, as observed during the year, is carried over from year to year on live cotton roots in the soil.

CENTRAL PROVINCES.

61. *Botanical Scheme.*—This is one of the oldest schemes sanctioned in 1923 and has for its object the breeding of wilt resistant, heavy yielding and fine spinning types of cotton to replace the coarse local mixture in the Central Provinces and Berar. This scheme is the continuation of the botanical work which the Department of Agriculture had already started and it was therefore possible to secure within four years a good yielding wilt resistant type, *Verum 262* which could spin up to 22's as against only 10 to 12's of local cotton. This new variety soon became so popular with the cultivator, because of its high yield and the good premium paid for it, that the Committee felt convinced in 1929 of the necessity of sanctioning a seed distribution scheme with the help of which the Department of Agriculture were able to spread this cotton more quickly than otherwise. It was however soon found out that this cotton was susceptible to adverse climatic conditions and attention was therefore diverted to the selection from the material available of new strains free from this defect and if possible with better yielding and spinning qualities. Three such strains, *viz., V. 434, Late Verum* and *V. 438,* have since been obtained and their distribution in the place of *V. 262* was seriously commenced during the year under report. *V. 434,* the best of the three new types, is hardy, prolific and superior in lint qualities besides being drought resistant and proved a great success during the year on an area of 2,000 acres under a wide range of conditions. It gave an average yield of 635 lb. of *kapas* (seed cotton) per acre on the Akola Farm and reports of similar encouraging yields have been received from everywhere it was tested. It is adjudged suitable for spinning up to 37's and was paid a premium of Rs. 10 to 20 per *khandy* of 784 lb. over *V. 262* and *Late Verum.* It was sold in the Central Provinces at Rs. 300 per *khandy* when *Oomras* and *Broach* were selling in Bombay at Rs. 212 and Rs. 227 respectively. This cotton is expected to occupy an area of 20,000 acres in 1935-36 season. *Late Verum* spins up to 36's and is well suited for localities where the rainfall is heavy and the monsoon extends late in the season. It was grown during the year on an area of about 16,000 acres and the results obtained were so satisfactory that it is expected to cover about 100,000 acres in the next season. *V. 438* was extensively tested for its suitability for soils of lighter descriptions and the results were quite encouraging. Steps have been taken to extend this cotton on areas for which it has been developed. The scheme has yielded several other strains of distinct promise which require further testing.

62. *The Entomological Scheme* was commenced in June 1934 for a preliminary survey of the cotton boll-worm pest in the Central Provinces and Berar

where it has been doing considerable damage to cotton, with a view to ascertain its incidence, method of carry-over from year to year and the extent to which the results obtained from the Surat Entomological Scheme could be usefully applied in this province. The work of the year shows the presence of a much larger population of pink (*Platyedra gossypiella*) and spotted (*Earias spp*) boll-worms at Akola than at Nagpur which is probably due to more suitable climate and higher concentration of cotton cultivation at Akola. At both these centres the spotted boll-worm starts its attack on tender shoots when the crop is 3 to 4 weeks old and causes much damage to flower buds and green bolls from September onwards. The pink boll-worm, on the other hand, does not make its appearance till about September and its damage is negligible till the latter part of December by which time nearly 85 per cent of the crop is harvested. The pink boll-worm is not thus a serious pest in the Central Provinces and Berar though the combined effect of the two boll-worms is very severe towards the end of the season. The total loss due to the pink and spotted boll-worms is estimated, from the results of night caging experiments, at 51 per cent of the crop harvested. In addition only 77 per cent of cotton harvested is undamaged and of the rest, 20 per cent is made up of half eaten seed, the remaining 3 per cent being rendered useless. The spotted boll-worm is carried over from season to season by cotton plants left over in fields after harvest, tender shoots sprouted from cotton stubbles after hot weather showers, perennial cotton trees and several malvaceous plants. The method of carry-over of the spotted boll-worm is thus practically identical in the Central Provinces and Berar and the Surat tract of the Bombay Presidency where this pest was studied in detail for 8 years from 1923 to 1931. This shows that the only possible practical remedy for the spotted boll-worm lies in clearing up immediately after harvest of all cotton stalks and stubbles and the eradication of other malvaceous plants that harbour the insect. The pink boll-worm lives during the off-season in cotton plants left over after harvest, perennial cotton trees, unginned cotton, stacks of cotton stalks and soil cracks in fields.

United Provinces.

63. *The Cotton Survey Scheme* was started in July 1933 for the detailed survey of the *Bengals* types of cotton grown in Rohilkhand and Bundelkhand to facilitate the selection of suitable types of cotton for the different cotton growing areas of the province. In 1933-34 about 5,000 samples of cotton were collected from as many as 1,852 villages in Rohilkhand and the best 396 of them were tested in 1934-35 for purity. Most of these samples were found to be crosses and were therefore discarded. From the few samples that appeared to be pure 443 plants were selected and examined for all important characters and the most promising of them would be further tested in 1935-36. Similar survey was started in Bundelkhand during the year under report when over 6,000 samples of cotton were obtained from 1,101 villages, and the best of them will be tested next year for purity in a Government Farm. It was observed during the survey that the yellow flowered and narrow lobed type of cotton was most predominant throughout Bundelkhand while the white flowered type was confined only to localities where the means of

communication was good and the Department of Agriculture had distributed pure seed. It was also observed that in places, far away from towns and regular markets, the crop on the whole was more homogeneous and better in staple than in other localities. Better types of cotton were seen growing in Mohoba *Tehsil* of Hamirpur district, Lauri *Tehsil* of Chaterpur State, Moth *Tehsil* of Jhansi district and Tehrauli *Tehsil* of Orchha State.

BURMA.

64. *Cotton Improvement Scheme.*—The local practices of dry cultivation in Burma are still so unsatisfactory that unless the cultivator is first taught the better methods of cotton cultivation there is little advantage of the distribution of the improved strains of cotton which the Department of Agriculture have been able to secure. The main object of the scheme is therefore to bring into general agricultural practice the up-to-date methods of cultivation by means of demonstration holdings in suitable centres and the scheme commenced in April 1931. The work of the year continued on the same lines as in previous years. There were in all 24 Demonstrators in charge of 75 holdings in Meiktila, Myingyan, Sagaing and Lower Chindwin districts. The demonstration holdings are producing conspicuous effect on the cultivators and the improvement obtained in many of these holdings after a few years' work is very encouraging. During the year under report the average yield of seed cotton on demonstration holdings amounted to 315 lb. per acre against 240 lb. in Meiktila district, 197 lb. against 172 lb. in Myingyan district, 255 lb. against 211 lb. in Sagaing district and 311 lb. against 244 lb. in Lower Chindwin district. Drill sowing increased from 2,607 acres in 1931-32 to 12,328 acres in 1934-35 and a large number of cultivators round about the demonstration holdings have adopted several improved methods such as the layout of fields, bullock cultivation, conservation of manure, etc.

HYDERABAD.

65. *Botanical Research Scheme.*—Hyderabad is the third biggest cotton growing territory in India, and had some years back the reputation of producing one of the best indigenous cottons, *viz.*, *Gaorani* or *Bani*, a long staple variety with low ginning percentage. This cotton has been now largely replaced by high ginning short staple *neglectums* and the object of the scheme, therefore, is to study the several varieties of cotton now grown in Hyderabad and secure from them a few high ginning medium staple types to replace the present mixtures in different parts of the State. The scheme commenced in 1929 and of the large number of pure strains that have been since then obtained *Gaorani 4*, *Gaorani 6*, *Gaorani 55* and *Parbhani 25*, which were found promising last year, have again proved this year their superiority in all important respects over the control, local *Gaorani Umri*. Among the four new strains themselves, *Gaorani 4* appears to be most promising though it is slightly inferior to the rest in ginning percentage and to *Gaorani 6* in spinning value. It has staple over $\frac{7}{8}$" long suitable for spinning up to 34's. *Gaorani 4* and the next best strain, *Gaorani 6*, have also given very encouraging results in district trials and it is proposed to distribute their seed in the next season for about 1,000 and 600 acres respectively. In another set of comparative tests between *Gaorani 9*,

Gaorani 12, *Parbhani 9*, *Havri 3* and *Parbhani* local, only one strain *Havri 3*, a *roseum* type, came up to the level of *Parbhani* local in yield. *Havri 3* and *Parbhani 9*, a *Banilla* type, gave higher ginning percentage while *Gaorani 9* and *Gaorani 12* had longer staple length than the rest. There were two other sets of preliminary comparative tests for the latest strains. Eight of these strains from one set and six from the other have been selected for further trials. Purity tests were as usual continued.

66. *The Cotton Survey Scheme* is a natural consequence of the above scheme and has for its object a detailed survey of the cottons grown in Hyderabad as an essential preliminary for the selection of suitable strains of cotton. It commenced in June 1931. During the year under report, 207 samples of cotton—119 of *Kharif* and 88 of *Rabi*—were obtained from Mahbubnagar, Medak, Nizamabad, Raichur, Karimnagar, Asifabad, Warangal and Nalgonda districts and an examination of these samples, after growing them in Parbhani and Rudroor Farms, has shown that over 95 per cent of the *Kharif* crop grown in all the above districts consists of *G. indicum*, *G. neglectum* and *G. hirsutum* with 1 to 8 per cent of *Rabi* types, *viz.*, *G. herbaceum*, *G. obtusifolium var Cocanada* and the *Rabi* type of *G. indicum*. The analysis of *Kharif* samples discloses that in Parbhani, Bir and Raichur districts the bulk of *Kharif* crop, upto 70 per cent, is made up of *G. neglectum* with *G. indicum* up to 20 to 30 per cent in the first two districts and about 15 per cent in the third. In all the remaining districts the proportion of *G. indicum* is as high as 50 to 95 per cent against 1 to 33 per cent of G. *neglectum*. *Rabi* samples, on the other hand, indicate that *G. herbaceum* is almost the only type grown as *Rabi* crop in Karimnagar district and the northern part of Warangal district. Similarly *G. obtusifolium* in Nalgonda district and the southern part of Warangal district and *G. indicum* in Asifabad district are more or less the only cottons grown as the *Rabi* crop. The above analysis of the *Kharif* and *Rabi* crop agrees more or less with the results of the survey of standing crop carried out during the year in 147 villages of all the above mentioned districts.

67. *Pink and Spotted Boll-worm Scheme.*—This scheme is the outcome of the preliminary investigations carried out in 1931 and 1932 by the Cotton Research Botanist, Parbhani, which gave an indication of the part played by the pink and spotted boll-worms in Hyderabad. In the light of this information the Committee felt convinced of the necessity of starting a detailed enquiry of these pests and sanctioned the scheme which commenced in June 1933 for finding out (*a*) the actual amount of damage done by them to cotton in the Godavary Valley, (*b*) the progress of their attack on the growing crop, (*c*) the mode of their carry-over from season to season and (*d*) the effect of the likely control measures. The work of the year shows that the spotted boll-worm is practically never absent and is seen breeding during the off-season on cotton plants left over in fields and alternative host plants, while the pink boll-worm does not make its appearance till June. By about August when all cotton fields of the previous season are ploughed up for the next rotation crop the two boll-worms are seen having passed over to the new cotton crop. In September and October the spotted boll-worm increases in numbers at a much quicker rate than the pink boll-worm but from November onwards the latter

outstrips the former. The maximum incidence of the attack of the spotted boll-worm is attained in about the middle of December when it commences to decline till about the middle of February when it again starts increasing. The pink boll-worm pest on the other hand reaches its maximum in January-February and begins to decrease thereafter till it becomes negligible at the end of April. The combined average maximum intensity of attack of the two boll-worms for any one week during the year was 21 per cent on flower buds, 57 per cent on flowers and 58 per cent on green bolls, the actual average loss of yield for the whole season being 18 per cent. It has been ascertained that due to the local practice of renewing the leases of cultivated fields every year, over 13 per cent of the area sown to cotton in the Godavary Valley remains uncultivated till about June and even later and the cotton plants of the previous season left remaining in the uncultivated area serve as a breeding ground for the pink and spotted boll-worms during the close period. The spotted boll-worm is seen breeding on other host plants which do not appear to play any part in the carry-over of the pink boll-worm. The two boll-worms hibernate in the soil but while the larvæ and cocoons of the spotted boll-worm were found in the soil only for about a fortnight after the removal of cotton stalks, pink boll-worms were found even after the soil was ploughed. In Hyderabad, unlike in other provinces, cotton seed does not appear to serve as a means of the carry-over of the pink boll-worm, probably due to severe summer heat.

Baroda.

68. *The Root Rot Scheme* commenced in February 1932 for the purpose of studying the root rot disease and breeding root rot resistant strains with high yielding and good spinning qualities to replace the local cotton in Baroda. The work of the year is for the most part a repetition of what was done last year. Cultures from the affected parts of cotton roots have given again the same organisms as were observed in previous years, *viz.*, *Macrophomina phaseoli* (*Rhizoctonia bataticola*), *Cephalobus* species of nematodes and *Fusarium vas infectum*. These organisms were also observed again in the roots of several other crops and weeds suffering from root rot disease. *Rhizoctonia* is found to be the real cause of the disease and it enters cotton roots through the injuries caused to their tender rootlets by nematodes. Other organisms present are harmless. *Rhizoctonia* and nematodes have been traced up to two feet below the soil surface but their activity is mostly confined to the first one foot. *Rhizoctonia* is most active at temperatures between 30°C and 40°C and at 30 per cent humidity. These conditions are usually present when cotton is sown by the aid of irrigation in summer months and this appears to be the reason for severe root rot disease on cotton grown in May under irrigation. The thermal death point for the *Sclerotia* of *Rhizoctonia* is 60°C which is much above the temperature ever observed at any part of the year in Baroda. Nematodes have their optimum temperature at 25°C—30°C and thermal death point at 50°C. Manurial trials and disinfection treatments have not given any significant results. On breeding side, two varieties of cotton, *viz.*, *Rozi* and *Karkhadi* and two pure strains, *Broach 9* and *Broach 8*, have been found more tolerant to root rot than other cottons grown in Gujerat. A few selections

have been made from some pure types and they will be further examined in the next season.

69. *Goghari Cotton Survey Scheme.*—This scheme which is similar to the *Goghari* cotton survey scheme in the Bombay Presidency was sanctioned in August 1934. The field survey during the year shows that while 10 per cent of the cotton crop in the Navsari area was *Goghari*, very little *Goghari* mixture was observed in Palsana, Mahuwa and Gandevi talukas.

BIKANER.

70. *The Gang Canal Scheme* has for its object the selection of superior types of cotton which could spin up to 25's and the study of certain agricultural problems. It was started in January 1931. The results so far obtained definitely indicate that under the present agricultural conditions Cawnpore 520 (*desi* type) is best suited to the Gang Canal area and a beginning has been made to multiply this seed for general distribution. *Cawnpore 520* gives the highest yields when it is sown in June while for *Mollisoni* the next best type, the best sowing period is the middle of May or early June. *Mollisoni* gives satisfactory yields with even three irrigations when they are suitably adjusted, while *289-F* requires 6-11 irrigations, but both the types are adversely affected in regard to staple length and ginning percentage when the number of irrigations is decreased. Fallow and compost treatments have little or no effects on cotton while it responds favourably to green manuring.

CHAPTER V.

SEED DISTRIBUTION SCHEMES.

71. THE Indian Central Cotton Committee felt convinced in 1929 that botanical and other research on cotton was of little consequence unless the results were made easily available to the cultivator and adopted accordingly the policy of helping the Departments of Agriculture and Co-operative Sale Societies in wider distribution of pure seed of the improved varieties of cotton. Sixteen seed schemes have since been sanctioned. Thirteen of them including the United Provinces C. 402 Scheme, which was started only in May 1935, are now under operation and one scheme for the sale of all farm crop produce in the Punjab was withdrawn during the year. The remaining two schemes, *viz.*, Bilhongal and Haveri, have not yet been commenced for one reason or other though they were sanctioned as far back as in November 1929.

MADRAS PRESIDENCY.

72. *Tiruppur Co. 2 (Cambodia) Seed Extension Scheme.*—The Committee sanctioned in 1929 a small scheme, the Madras (Tiruppur) Seed Extension Scheme, providing the pay of an officer to act as an advisor to a group of Co-operative Societies in Coimbatore District which had been interested in the distribution of *Co. 2* seed, and the scheme started in May 1931. It was amalgamated in 1933 with a new seed scheme, Tiruppur Co. 2 (Cambodia) Seed Extension Scheme, sanctioned in August 1932 for the distribution of *Co. 2* seed in Salem and Coimbatore districts through the agencies of the Agricultural Department and the Tiruppur Co-operative Trading Society. The Department of Agriculture with the help of the Committee's grants arranges every year a seed multiplication area of about 6,000 acres, while the Tiruppur Co-operative Trading Society has undertaken to gin pure all the seed cotton obtained from the above area and distribute the seed to cultivators for about 100,000 acres. The Society in return has been guaranteed its actual loss on seed transactions upto a maximum of 10 per cent of the capital invested for the purchase of seed and interest thereon at 5 per cent. The Department of Agriculture arranged during the year a seed farm area of 4,122 acres which yielded 1,106,700 lb. pure seed. About a third of this quantity had to be discarded as it was found unfit for sowing and the rest was distributed for an area of about 29,600 acres.

73. *The H1 (G. herbaceum) Seed Extension Scheme* has been suspended due to the difficulty of securing local co-operation in the supply of improved seed in the Bellary district. The question of a revised scheme is under consideration.

BOMBAY PRESIDENCY.

74. *Hubli Seed Extension Scheme.*—The main object of this scheme which came into operation in June 1930 is that every year the Department of Agriculture should maintain a total seed multiplication area of about 16,000

acres of *Jayawant* cotton and the seed obtained from this area should be purchased and distributed by the Hubli Co-operative Cotton Sale Society for about 200,000 acres. The Committee has in its turn agreed to meet the cost of rogueing the crop of the seed multiplication area and to pay the Society a subsidy not exceeding Rs. 5,000 per year to cover its loss, if any, on its seed transactions and interest at 5 per cent on the capital invested for the purchase of seed. The Department of Agriculture has till now fully discharged its obligations by maintaining the seed multiplication area as stipulated in the scheme. The area covered by the Society, however, fell short of expectation every year for one reason or other. During the year under report the Society was able to distribute 1,462,861 lb. of *Jayawant* seed enough for 146,286 acres, the largest area covered by it since the beginning of the scheme.

75. *The Gadag Seed Extension Scheme* is very similar to the above scheme except that the seed multiplication area required to be maintained in this scheme is 24,400 acres of *Gadag 1* cotton as against 16,000 acres of *Jayawant* in the Hubli Scheme and it commenced in June 1930. The area covered by the Gadag Society did not exceed 100,000 acres in any one year except in 1931-32 when it was able to distribute enough seed for 125,000 acres, while the Department of Agriculture maintained the stipulated area for seed multiplication. The Society stocked and distributed during the year under review enough seed for 90,250 acres.

76. *Surat Seed Extension Scheme.*—This scheme was first sanctioned in 1929 for two years and was extended in 1931 for another two years pending the final decision of the Committee with regard to its policy in Surat area. The Committee in January 1934 after full consideration of the merits of the two rival cottons *1A* and *1027 A.L.F.* finally decided to confine its attention to the latter and extended the scheme for a further period of five years. The Department of Agriculture arranged during the year a seed multiplication area of 14,347 acres and distributed 1,506,225 lb. of *1027 A.L.F.* seed in Surat-Broach tract besides supplying another 377,829 lb. to the adjoining States of Chhota Udepur and Baroda. In addition the Hansot Co-operative Cotton Sale Society distributed in the area served by it another 428,734 lb. obtained from its members. It is gratifying that many Cotton Sale Societies, which had been till recently opposed to the distribution of *1027 A.L.F.* seed, have now accepted the Committee's policy and purchased large quantities of this seed.

77. *The Khandesh Seed Extension Scheme* was started in May 1931 with the object of extending *Banilla* cotton, a cross between *Bani* and *Comilla* cottons, in the Khandesh area. This cotton is susceptible to wilt and has also suffered in spinning quality since its first introduction; with all its defects, however, it is much superior to local cotton and gives better returns. It became therefore so popular with the cultivator in 1930 that it began to spread rapidly on its own merits and the Committee thought it desirable to sanction the scheme with a view to make this seed easily available in adequate quantities till a better strain is obtained from the Jalgaon Cotton Breeding Scheme. The

Department of Agriculture maintained during the year a seed multiplication area of 15,985 acres which produced 1,965,000 lb. pure seed enough to cover an area of 65,000 acres in the next season. Pure *Banilla* fetched a premium of Rs. 10 to Rs. 15 per Bombay *khandy* over local cotton.

78. *Athani Seed Extension Scheme.*—The object of this scheme which commenced in April 1932 is similar to that of the Hubli Seed Extension Scheme, *viz.*, the multiplication and distribution of *Jayawant* seed in the Athani Taluka of Belgaum district, the only difference between the two schemes being that while the Athani scheme is under the entire control of the Agricultural Department, the Hubli scheme is controlled partly by the Agricultural Department and partly by the Hubli Cotton Sale Society. The total seed multiplication area expected to be maintained during the year according to the original programme was 11,100 acres, but due to the loss of cotton crop by floods last year and consequent dearth of pure seed, it had to be reduced to 4,594 acres from which 421,232 lb. seed were obtained for distribution in the next season, for the same reason the total quantity of *Jayawant* seed distributed to the cultivators during the year under report was enough only for about 27,650 acres.

79. *The Deccan Canals* (*Banilla*) *Seed Extension Scheme* is practically self-supporting unlike other seed schemes, its recoveries being expected to cover its entire cost. Under irrigation in the Deccan Canal area *Banilla* gives as high yield as local *N. R.* and brings a premium of about Rs. 15 per 500 lb. of seed cotton over the latter. The total area expected to be covered by this cotton is, however, only 30,000 acres. The Committee in 1934 considered the advantages of replacing *N. R.* with *Banilla* in this tract and sanctioned the scheme with a view to provide the cultivator with pure *Banilla* seed in sufficient quantities. During the year under review 32 acres of Kopergaon Farm were sown to pure *Banilla* and of the total quantity of 18,650 lb. of seed obtained, 18,000 lb. were supplied to seed growers the rest being retained for sowing on the Farm next year.

80. *Sind Cotton Extension Scheme.*—This scheme was started in April 1931 with a view to introduce cotton cultivation in areas where this crop was not grown before and to extend improved varieties in localities where cotton had already been established. The work continued more or less on the same lines as in previous years on both the left bank and the right bank of the Indus. On the left bank the main items of work consisted of (*i*) comparative tests of improved cottons, (*ii*) trials of high quality cottons such as *Sea Island, Ashmouni*, etc., and (*iii*) multiplication and distribution of improved seed. In comparative trials the same four varieties that were tested in previous years, *viz.*, *27 W. N.* or *desi* (36 ginning percentage, $\frac{3}{8}$" to 4/8" staple length and 6's highest warp count), *4F-98* (34 ginning percentage, 7/8" staple length and 30's highest warp count), *285F-2* (30 ginning percentage, 1" staple length, and 40's highest warp count) and *289F-1* (30 ginning percentage, 1" to $1\frac{1}{16}$" staple length and 40's highest warp count) were again tested in replicated plots in as many as 43 different centres and the results show once again close competition between *27 W. N.* and *289F-1* for highest yield. *289F-1* gave the highest average yield in Southern Jamrao and Eastern Nara tracts of Thar

Parkar district and in the northern part of Hyderabad district, while *27 W.N.*, closely followed by *289F-1*, took the highest place in northern Jamrao tract, southern part of Hyderabad district and in Naushahro and Nawabshah Divisions of Nawabshah district. High quality cottons, *Ashmouni 37*, *Boss III-16* and *Sea Island 2-4* were tried in nine centres in Southern and Northern Jamrao tracts and the results surpassed even the highest expectations. The Department of Agriculture organised a seed multiplication area of 2,710 acres and distributed 785,335 lb. of pure seed in addition to 411,430 lb. distributed by the Sind Provincial Co-operative Bank. A very important feature of the left bank during the year was the keen demand for *289F-1* seed not only in Thar Parkar district where this cotton is extensively grown, but also in Nawabshah and Hyderabad districts where only *desi* types were hitherto under cultivation.

On the right bank cotton cultivation was unknown till 1931-32 when on starting the scheme a small area of 25 acres was for the first time brought under this crop. With this small beginning the area under cotton increased to 4,000 acres during the year and there is every prospect of this crop extending over a very large area. The results of the past four years indicate that *4F* is better suited for the right bank than *desi* or any other cotton so far tested and that the soils of Dadu district are better fitted for cotton cultivation than those of Larkhana district which have been for a long time under rice cultivation.

Central Provinces and Berar.

81. *The Verum Seed Distribution and Marketing Scheme.*—The main object of this scheme when it was started in September 1930 was to extend *Verum 262*, but on the expiry of the scheme in July 1934, the Committee in pursuance of its new policy to encourage wherever possible medium and long staple cottons in short staple areas, sanctioned this combined seed distribution and marketing scheme for the extension and marketing of long staple cottons. The total quantity of pure seed distributed during the year amounted to 3,099 *khandies* (2,429,616 lb.) which were enough for sowing on 110,000 acres. 5,277 *khandies* (4,137,168 lb.) of pure seed were purchased and stocked for distribution in 1935-36 season. The Department of Agriculture were also able to arrange the sale of 5,750 bales of pure cotton at a premium ranging from about Rs. 13-5 to Rs. 90 per *khandy* of 784 lb. over *Broach*; the average premium for the whole lot works out at Rs. 62-3 over *Broach* and Rs. 82 over *Oomras* on the basis of F.O.R. Bombay.

82. *The Hyderabad Seed Extension Scheme*, which came into operation in March 1930, has for its object the extension of *Jayawant* and *Upland* varieties in Raichur-Gulburga area. The total quantity of pure seed distributed during the year amounted to 487,782 lb., but due to the scanty rainfall at the time of sowing, only a small portion of this seed was sown on an area of 6,370 acres against 24,000 acres of the previous year. The Department of Agriculture made a serious effort to organise a large seed multiplication area but it ended

in disappointment for want of rains. They had therefore to depend once again on Hubli, Gadag and Kopbal Cotton Sale Societies for their seed supply in 1935-36 season.

BARODA STATE.

83. *Baroda Seed Extension Scheme.*—The object of this scheme is similar to that of the Surat Seed Extension Scheme, *viz.*, the extension of *1027 A.L.F.* cotton in Baroda State and it started work in April 1934. During the year under review the Department of Agriculture distributed a fairly large quantity of 231,285 lb. pure seed enough for sowing on 20,230 acres including the seed multiplication area of 5,382 acres. In Baroda as in other parts of Gujerat cotton suffered heavily from frost and the Department of Agriculture have made necessary arrangements to meet the demand for pure seed during the next season.

RESEARCH STUDENTS.

84. Ever since its establishment the training of research workers in the various branches of science pertaining to cotton has been one of the Committee's principal concerns. Distinguished graduates are selected and placed for training under experienced research workers either on the Committee's schemes, at the Institute of Plant Industry, Indore, at the Committee's Technological Laboratory or under Professors in Indian Universities. Sometimes scholarships are awarded to students for training abroad at recognised institutions. The term of scholarships is usually two years, but extensions are sometimes sanctioned if found necessary.

Scholarships are awarded under two categories, *viz.*, Training Grants and General Scholarships. The former are intended for Government servants who are recommended by provincial governments and for employees of the Committee who are considered suitable. General Scholarships are awarded to University Graduates who are selected by the Research Students Selection Sub-Committee. Applications for this class of scholarships are invited by advertisement in leading Indian newspapers.

Fifty-two research scholarships and six training grants have so far been awarded by the Committee; out of these one scholarship and four training grants were for foreign study. During the year under report eight research students were under training—three in India and five abroad. Only one scholarship was awarded during the year.

Expenditure on Research Studentships up to the 31st August 1935 amounted to Rs. 243,145-2-4.

P. H. RAMA REDDI,
Secretary.

CHAPTER VI.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, FOR THE YEAR ENDING 31st AUGUST 1935.

THE present report contains an account of the work done at the Technological Laboratory from 1st September 1934 to 31st August 1935. A notable event in the life of the Laboratory which took place during this period was the extension of several of its sections. The work of the Laboratory had grown steadily from year to year ; during the past few years especially it had increased at a high rate. In order to cope with this increase in the work, it had become necessary to employ more staff and to install more machines and testing apparatus from time to time. As a result the Spinning Room, the Yarn Testing section and the Fibre Testing section had become overcrowded to an extent which threatened to lower the efficiency of the work. Moreover, the blow-room plant of the Spinning Laboratory was installed more than 10 years ago. With the recent improvements in the design and construction of the blow-room machinery some of our machines had become obsolete. In view of the fact that the Indian Central Cotton Committee aims, on the one hand, at maintaining a high standard of efficiency in the work of the Laboratory and, on the other, at keeping in the van of the progress by employing most modern machinery and testing apparatus, it was felt that the time was ripe for relieving the pressure on the testing resources of the Laboratory and for overhauling the blow-room machinery. Full details of the extensions carried out with these two objects will be found on page 66. The work done at the Laboratory will now, as usual, be described under the following five heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the samples of different cottons tested at the Laboratory during the period under review together with the names of the suppliers of the samples :

BOMBAY.

(1) *The Cotton Breeder, S.M.C., Dharwar.*—9 samples of Jayawant and other cross strains.

(2) *The Cotton Breeder, Jalgaon.*—18 samples of Banilla, N. R. and local cottons.

(3) *The District Cotton Overseer, Hubli.*—One sample of Jayawant cotton.

(4) *The Principal Agricultural Officer, Padegaon.*—9 samples from irrigation and soil experiments.

(5) *The Cotton Breeder, Surat.*—4 samples of different strains and 4 samples of 1027 A. L. F. and B. D. 8 mixings.

(6) *The Superintendent, Agricultural Station, Broach.*—One sample of B. D. 8.

(7) *The Cotton Breeder, Broach.*—Two samples of selections, one of Broach Local, and 3 samples of B. D. 8 and other strains.

(8) *The Cotton Breeder, Viramgam.*—One sample of Wagad Local, Wagad 8 and 3 selections and 4 samples of B. D. 8 and other selections.

(9) *The Officer in charge, Government Seed Farm, Mirpurkhas.*—10 samples from irrigation and manurial experiments.

(10) *The Botanist in Sind, Sakrand.*—One sample of 4F cross strain, 7 samples of Boss III, Sea Island and other strains.

(11) *Cotton Supervisor, Indus Right Bank, Dadu.*—3 samples of 289F-1 and other strains.

(12) *Cotton Physiologist, Agricultural Research Station, Sakrand.*—10 samples from irrigation and manurial experiments.

(13) *The Agricultural Chemist and Soil Physicist, Sakrand.*—5 samples of 289F from irrigation experiments.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—19 samples of different strains, 3 samples of 43F, Mollisoni and 289F.

(2) *The B.C.G.A., Jhudo.*—One sample of Sind L. S. S.

UNITED PROVINCES.

The Economic Botanist to Government, U.P., Cawnpore.—7 samples of C. 402 and 520 selections.

CENTRAL PROVINCES.

(1) *The Economic Botanist for Cotton, C.P., Nagpur.*—3 samples of Bani and other selections and 5 samples of strains.

(2) *Superintendent, Government Farm, Akola.*—One sample of Late Verum.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—Six samples from rotation experiments, one of Co. 2 and 3 strains, one sample of Khlay cotton.

(2) *The Superintendent, Agricultural Research Station, Koilpati.*—9 samples of different strains and one sample of Uppam cotton.

(3) *The Farm Manager, Agricultural Research Station, Guntur.*—7 samples of different strains.

(4) *The Assistant Director of Agriculture, Salem.*—2 samples of Co. 2.

MISCELLANEOUS.

(1) *The Director, Institute of Plant Industry, Indore.*—26 samples from multiplication, sowing, manurial, irrigation and other experiments; 5 samples of Malvi and other strains.

(2) *The Agricultural Inspector, Devangere.*—One sample of Selection 69 and one of Local Sannahatti.

(3) *The Agricultural Inspector, Chitaldrug.*—3 samples of Selection 69.

(4) *The Senior Assistant Botanist, Mysore State, Bangalore.*—One sample of H. 190, 3 samples of Selection 69 and 10 samples of different selections.

(5) *The Cotton Research Botanist, Parbhani.*—10 samples of Gaorani and other selections.

(6) *The Agricultural Officer, Bikaner State, Ganganagar.*—Three samples of Mollisoni from irrigation experiments.

(7) *The Crop Botanist, Malwa Division, Ujjain.*—10 samples of different selections.

(8) *The Inspector, Cotton Seed Distribution, Kopbal.*—One sample of Jayawant.

(9) *The Officer in charge, Cotton Research Station, Baroda.*—One sample of Broach 9.

(10) *The Second Economic Botanist, Bengal, Dacca.*—One sample of Co. 2 (Bengal) cotton.

(11) *The Director of Agriculture, Peredaniya, Ceylon.*—One sample of Cambodia cotton grown in Ceylon.

(12) *The Senior Botanist, Bukalasa Experimental Station, Bombo, Uganda.*—8 samples of Uganda cottons.

It may be mentioned here that after a considerable lapse of time a sample of Cambodia cotton, of which seed had been obtained from the Madras Presidency, was received from the Director of Agriculture, Ceylon, where it had been grown. Also, another sample of the same cotton was received for the first time from the Second Economic Botanist, Bengal, Dacca. The receipt of these two samples at the Laboratory indicates the efforts that are being made in India and in adjacent countries to extend the cultivation of medium staple cottons.

The following tables give the distribution of samples, lots and counts spun and tested at the Laboratory in each season since 1924 :—

TABLE I.—*Distribution of Samples Spun,* 1924-35.

Province	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	Totals 1924-35
Bombay	18	26	22	22	28	66	89	69	143	111	97	691
Punjab	14	1	..	..	42	30	10	44	55	42	23	261
United Provinces ..	7	..	6	11	9	7	16	7	12	6	7	88
Madras	2	19	50	23	30	51	66	15	28	101	30	415
Central Provinces ..	2	..	3	2	2	5	3	3	5	9	9	43
Miscellaneous	3	11	..	6	6	27	28	33	75	97	85	371
Total ..	46	57	81	64	117	186	212	171	318	366	251	1,869
Standard Cotton Tests.	8	54	49	64	33	34	27	18	18	16	18	339
Trade Tests and Special Tests	..	..	..	..	..	37	89	134	125	166	131	682
Total Tests ..	54	111	130	128	150	257	328	323	461	548	400	2,890

TABLE II.—*Distribution of Lots Spun,* 1924-35.

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35.	Totals 1924-35
Bombay	36	52	44	44	53	107	90	69	143	111	97	846
Punjab	26	4	..	..	83	41	10	44	55	42	23	328
United Provinces ..	14	..	12	22	18	14	16	7	12	6	7	128
Madras	4	38	100	46	60	85	66	16	28	101	30	574
Central Provinces ..	3	..	6	4	4	10	4	3	5	9	9	57
Miscellaneous	3	22	..	12	9	33	29	33	75	97	85	398
Total ..	86	116	162	128	227	290	215	172	318	366	251	2,331
Standard Cotton Tests.	34	176	142	178	68	64	54	36	36	32	36	856
Trade and Special Tests.	..	..	..	..	..	37	119	186	129	175	175	821
Total Tests ..	120	292	304	306	295	391	388	394	483	573	462	4,008

TABLE III.—*Distribution of Yarns Spun*, 1924-35.

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	Totals 1924-35
Bombay	103	152	132	132	159	322	253	203	430	332	292	2,510
Punjab	106	14	..	..	254	113	31	136	165	127	72	1,018
United Provinces ..	27	..	36	66	54	42	40	22	32	18	21	358
Madras	12	108	278	138	180	255	199	53	85	303	90	1,701
Central Provinces ..	8	..	18	12	12	30	12	9	15	27	29	172
Miscellaneous	3	58	..	36	27	99	100	93	227	293	250	1,186
Total ..	259	332	464	384	686	861	635	516	954	1,100	754	6,945
Standard Cotton Tests.	95	514	423	447	290	223	309	136	200	180	204	3,021
Trade and Special Tests.	..	..	..	..	..	80	343	502	256	499	810	2,490
Total Tests ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	12,456

It will be seen that as compared with the last year the total number of samples and lots spun in the Laboratory shows a decline, though the number of counts spun during the period under review is practically the same. The decrease in the number of samples and lots is due to the fact that for more than six weeks the processing of samples had to be slowed down in order to allow the dismantling of some of the old machines in the blow-room and the erection of new machines. Furthermore, as the Yarn Testing Section was also enlarged during the period under review, the testing of yarns in this section had also to be retarded in order to make provision for the re-arrangement of apparatus and equipment in the enlarged room. Although, on account of these reasons there was a small decrease in the number of samples completely tested, yet, as will be seen from Table I even this reduced number is in excess of those for all the previous years excepting the last two years.

The statement given on page 43 does not include those small size samples of cotton which were received only for fibre tests, nor the samples of yarn on which tests were carried out at the Laboratory. The former relate to strains which are as yet in the early stages of experimentation and on which a fibre test is required by the cotton breeder in order to narrow down his field of selection so that he may grow in the subsequent seasons the most promising strains in quantities sufficiently large for a spinning test. A statement, giving a description of these samples, together with the names of the suppliers is given on page 56. The yarn samples are mostly received from mills or firms in their private capacity and are tested at the Laboratory on payment of certain fees laid down by the Indian Central Cotton Committee. A full schedule of the fees for the various tests which are performed for the benefit of mills and firms will be found on page 52.

The results of the tests carried out at the Laboratory are embodied in spinning test, fibre test and yarn test reports. These reports are sent to the suppliers of the samples, and in the case of agricultural samples submitted by the cotton breeders copies of the reports are also sent to their supervising officers. The results of tests, however, on the trade samples supplied by the East India Cotton Association and the Millowners' Associations of Bombay

and Ahmedabad are published in the form of Technological Circulars, which are distributed for general information among the trade and the industry. The following table gives a statement of the number of reports falling under each class which were issued during the period under review together with the corresponding numbers for last year :—

TABLE IV.—*Test Reports issued*, 1924-35.

	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.
Spinning Test Reports	7	19	19	22	21	63	92	60	87	121	112
Fibre Test Reports	1	1	5	1	7	4	7	19	30	18	19
Yarn Test Reports	..	..	..	1	4	4	2	3	5	3	7
Total Reports	8	20	24	24	32	71	101	82	122	142	138

It will be seen that as compared with the last year more fibre test and yarn test reports were issued while the number of spinning test reports was somewhat less. The total number of reports issued during the period under review is slightly less than that of last year as fewer samples could be spun owing to the work involved in the extension of the Laboratory.

The strength of the permanent staff employed at the Laboratory from year to year since 1924 is given in the following table :—

As at August 31st in :	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Technical Staff	8	11	20	24	27	27	32	32	32	33	34	34
Research Students ..	1	3	6	4	3	2	1	1	..	..	..	..
Fumigation Chemists ..	..	..	2	4	2	2	2	2	2	2	2	2
Total ..	9	14	28	32	32	31	35	35	34	35	36	36

It may be mentioned here that in view of the large number of samples received for tests it was found necessary to employ two temporary Junior Testers for a period of four months each.

CLASSIFICATION OF SAMPLES.

The samples received for tests at the Technological Laboratory fall into the following four classes :—

(*a*) Agricultural samples.
(*b*) Standard Indian cottons.
(*c*) Trade samples.
(*d*) Technological samples.

We shall now describe briefly the work done under these four heads.

(*a*) *Agricultural samples.*—These samples are received from the cotton breeders and agricultural officers who are engaged in the work of improving the quality of cotton in the provinces. They mostly represent strains which are as yet in the experimental stage, but many samples are sent in connection with the field experiments undertaken by the Department of Agriculture on such problems as the effect of differential irrigation, effect of rotation of crops, effect of date of sowing, etc. Among these samples the following are worthy of special mention :

(1) *Effect of differential irrigation upon the fibre properties and spinning quality of cotton.*—These tests have been in progress at the Laboratory for some time past and at the February 1935 meeting of the Indian Central Cotton Committee a report containing the available results was presented. This report was very carefully considered by the Technological Research Sub-Committee and it was decided that as this investigation had yielded interesting results, it should be continued and that the results so far available should be published. In the current year samples for this purpose have been received from Lyallpur, Coimbatore, Sakrand, Ganganagar and Padegaon.

(2) *Uganda cottons.*—It will be remembered that for the last three years the Technological Laboratory has made tests on samples of improved variety of Uganda cottons, submitted by the Department of Agriculture, Uganda Protectorate. This year 8 samples were received for this purpose and a copy of the spinning test report, which was sent to the Department of Agriculture, Uganda, was also placed before the Technological Research Sub-Committee. The Department of Agriculture, Uganda, expressed its appreciation of the help given by the Laboratory and requested that in the next year facilities may be provided for testing 16 instead of 8 samples. This request was considered by the Technological Research Sub-Committee at its meeting held in August 1935 and it was decided that, as in the past, 8 samples may be tested free of charge but that for any additional samples the usual fees should be charged.

(3) *Tests on 38F and 43F.*—These two strains are further selections from Punjab-American cotton and have been under trial at Lyallpur for some years past. Having given very satisfactory results on the farm, it was decided to try them out in the cultivators' fields in order to see which of these two strains would be more suitable for general cultivation. Accordingly, about 20 samples of these two strains were received and tested at the Laboratory and reports embodying the results of fibre tests and spinning performance were sent to the Department of Agriculture, Punjab.

(4) *Tests on Boss III and Sea Island.*—These are two long staple cottons which are under trial in the new Barrage area in Sind. During the past six years that they have been tested at this Laboratory, they have given very satisfactory results and yarns ranging from 60's to 80's of satisfactory evenness have been spun from them. As it is possible that the cultivation of these cottons may be extended in the near future, rather more detailed tests which

included the spinning of carded and combed yarns were made on them in the current year. For purposes of comparison a sample of Egyptian Giza 7 was obtained and treated in the same manner and the results for the Sind cottons were compared with those obtained for Giza 7. A report containing the results of these experiments was sent to the Agricultural Department, Sind.

(*b*) *Standard cottons.*—As in the past detailed spinning and fibre tests were made on the standard Indian cottons of the last season. These cottons represent certain improved varieties, which are now being grown to the extent of 15 per cent. of the total area under cotton cultivation in India. This year four new varieties were included among the standard Indian cottons. Two of these came from Sind, where, as a result of the development of the Sukkur Barrage, the area under cotton cultivation is increasing at a considerable rate. These two cottons have been named " Sind Sudhar " and " Sind N. R." The former is an improved type of Sind-American and represents the long staple cotton which will be extended in Sind in the future. The latter is a selection from the Sind-Desi type, which has been selected for general cultivation in Sind on the basis of its stand in the field, yield, ginning percentage and colour. The other two new standard cottons are further selections of C. P. Verum 262 and are named " V. 434 " and " Late Verum ". The former is specially suited to areas where the rainfall is irregular, while the latter is specially suited to areas in which the monsoon is likely to continue late in the season. These cottons have been tested in the past at the Technological Laboratory and besides possessing the above mentioned advantages have given, on the whole, even better results than Verum 262.

As most of the standard cottons are now grown on a commercial scale and are available in the market, the results of fibre tests and spinning tests are published in the form of 4-page circulars soon after their receipt at the Laboratory. During the year under review 4-page circulars were published on the following nine cottons :—

1. Umri Bani.
2. Verum 262 (Nagpur).
3. Verum 262 (Akola).
4. Punjab-American 289F.
5. Punjab-American 4 F.
6. Jayawant (Kumpta).
7. Surat 1027 A.L.F.
8. Gadag 1 (Dharwar-American).
9. Cambodia Co. 2.

(*c*) *Trade samples.*—(1) As in the past spinning tests were made on samples of trade varieties which form the bulk of the Indian cotton crop. These samples are tested in accordance with the arrangements between the

Indian Central Cotton Committee on the one hand and the East India Cotton Association, Bombay, and the Millowners' Associations of Bombay and Ahmedabad, on the other. The cotton samples supplied by the East India Cotton Association under this arrangement are of fair average quality for the season, while those supplied by a number of mills through their Associations are of the early arrivals of the crop. The object of these tests is to supply first-hand information to the trade and the industry regarding the waste losses and the spinning quality of these cottons. The results of these tests are published in the form of 2-3 page circulars, which contain not only the results of the current season's tests but also of those carried out on the same variety in the previous seasons. Thus, these circulars not only furnish information regarding the performance of these cottons in the current season, but they also enable one to find out whether a given variety is maintaining its quality or is showing signs of deterioration. In view of the practical value of these tests, it has been decided to publish these circulars collectively in the form of a bulletin. The following statement gives the description of trade samples tested during the period under review :

Cottons supplied by the East India Cotton Association:—

1. C. P. No. 1.
2. Berar.
3. Khandesh.
4. Nanded.
5. Lattur.
6. Muttia.
7. Punjab-American.
8. Broach.
9. Jagadia Farm.
10. Surat.
11. Navsari.
12. Dholleras (Wagadia).
13. Kalagin.
14. Westerns (Jhaveria).
15. Farm Westerns.
16. Coompta.
17. Upland (Gadag).
18. Bijapur.
19. Bagalkote.
20. Cambodias.
21. Tinnevelly.
22. Karungannis.
23. A. R. Kampala.
24. A. R. Busoga.
25. A. R. Jinja.

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

BOMBAY.

1. Hansi (Bengal).
2. Saudha (Khandesh).
3. Ujjain (Central India).
4. Padtur (Moglai).
5. Mandsaur (Ujjain).
6. Hubli Compta.
7. Hubli Upland.
8. Surat.
9. Cambodia.
10. Guntakal (Westerns).
11. Shedbal (Miraj).
12. Farm Westerns.
13. Broach.
14. Bailhongal.
15. Tiruppur Cambodia.
16. Karunganni.
17. Nandyal.
18. Northern Cambodia.
19. A. R. Kampala.
20. A. R. Busoga.

AHMEDABAD.

Nil.

A list of the Technological Circulars issued on these samples will be found under " Publications."

In addition to these tests, of which the results are published for general information, the Laboratory also undertakes tests on samples supplied by mills and firms in their private capacity. During the year under review 39 such samples were received and reported upon. Of these, 14 samples were received for spinning tests, 8 for fibre tests, 12 for yarn tests, 2 for determination of wax content, one for fibre maturity and two for determination of blow-room loss. These tests are undertaken on payment of certain fees laid down by the Indian Central Cotton Committee which are reproduced below:

SCALE OF FEES.

		Rs.	a.	p.
(1)	Fibre or Yarn Test—			
	(*a*) Mean fibre-length	7	8	0
	(*b*) Fibre-weight per inch	7	8	0
	(*c*) Fibre-strength	10	0	0
	(*d*) Lea Test	7	8	0
	(*e*) Ballistic Test	7	8	0
	(*f*) Single Thread Test	7	8	0
	(*g*) Twist	7	8	0
(2)	Fibre and Blow-room Test—			
	(*a*) Fibre tests—As for (*a*)—(*c*) above ..			
	(*b*) Blow-room only	10	0	0
(3)	Full Test—			
	(*a*) Fibre tests—As for (*a*)—(*c*) above ..			
	(*b*) Spinning test only	35	0	0
	(*c*) ,, ,, on combed cotton ..	50	0	0
(4)	Variety of cotton (broad classification) ..	25	0	0
(5)	Identification of fibre (microscopic test) ..	15	0	0
(6)	Percentage of size	7	8	0
(7)	,, of grease	7	8	0
(8)	,, of free acid	15	0	0
(9)	Presence of mildew	7	8	0
(10)	Causes of mildew growth	30	0	0

		Rs.	a.	p.	
(11)	Percentage of immature fibres—				
	(*a*) In lint or kapas	10	0	0	
	(*b*) In yarn or cloth	15	0	0	
(12)	Wax content—				
	(*a*) 1 Sample	12	8	0	
	(*b*) 2 Samples	22	8	0	
	(*c*) 3 Samples	30	0	0	
	(*d*) Each additional sample	7	8	0	
(13)	Determination of mechanical injury to fibre.	10	0	0	
(14)	Tests in addition to the ordinary 3 roller system	10	0	0	per system.
(15)	Cloth Samples—				
	(*a*) Actual counts	15	0	0	
	(*b*) Actual twist	20	0	0	
	(*c*) Single thread strength	20	0	0	
(16)	Moisture Tests—				
	(*a*) 1 Sample	5	0	0	
	(*b*) 2 Samples	7	8	0	
	(*c*) 3 Samples	10	0	0	
	(*d*) 4 Samples	12	8	0	

(2) *African cottons.*—It will be recalled that during the last three years the Laboratory had undertaken fibre tests on samples of fair average quality of A. R. Kampala, A. R. Busoga and A. R. Jinja with a view to helping the East India Cotton Association to lay down standards of length for these cottons. During the period under review the final report on these cottons, comprising the results for 75 samples, was sent to the East India Cotton Association. It was considered in June last by their Special Appeal Committee on African cottons, who made their recommendation regarding the standards of length for these cottons to the Board of the Association on the basis of this report.

(3) *Effect of artificial watering on the spinning quality of cotton.*—These tests have been in progress for some time with the object of finding out the effect on spinning quality of the addition of a known quantity of water to cotton before it is pressed into a bale. For this purpose, the two cottons selected were Amraoti and Broach (Palej) and for each cotton a number of bales containing different quantities of water added to them before pressing were prepared, samples were drawn from these bales from time to time and subjected to fibre and spinning tests. During the period under review the results for the

Amraoti bales were placed before the Technological Research Sub-Committee at its meeting held in February 1935 and it was decided that when the results of the Broach (Palej) cotton are also available these should be published.

(4) *The effect of different degrees of compression on the spinning quality of cotton.*—It was originally the intention to make tests on two cottons, namely, Superfine Oomra and Punjab-American 289F, with a view to finding out whether, and to what extent, the spinning quality of cotton is affected by the degree of compression in a bale. The tests, however, could only be made on Superfine Oomra and the results of these tests were considered by the Technological Research Sub-Committee in February last. It was felt that the effect of compression if any would be more pronounced in the case of the comparatively long staple cottons. It was accordingly decided that these tests should be performed on Punjab-American 289F, Surat 1027 A.L.F., Jayawant, and Cambodia. Bales pressed to the same size but weighing nearly 400, 300 and 200 lb. of the four above-mentioned cottons have been purchased and the necessary tests will be made in due course.

(5) *Deterioration of cotton stored in the open and in shed at Karachi.*—During the period under review this investigation was also completed and a report containing the results and the main conclusions was placed before the Technological Research Sub-Committee at its meeting held in August last. The Committee decided that the results were highly interesting and that as they showed that cotton stacked in the thole yard definitely suffered both in grade and spinning performance, a copy of the report should be sent to the Karachi Cotton Association with the recommendation that they should request the Karachi Port Trust to provide more godown facilities at Karachi.

(*d*) *Technological Samples.*—

(1) *Limit spinning tests.*—In order to study the effect of insertion of twist on the strength, evenness and appearance of yarns an investigation has been undertaken with two cottons, namely, Superfine Oomra and Punjab-American 4F which were spun into suitable counts with different twist multipliers ranging from $3\frac{3}{4}$ to $5\frac{1}{2}$. This investigation is in progress.

(2) *High Draft tests.*—The Laboratory has already issued two Bulletins on the results of application of high draft spinning to Indian cottons. Since the publication of the last Bulletin some more systems of high draft spinning have been acquired by the Laboratory and accordingly another investigation has been undertaken in order to extend the scope of the former work. For this purpose mixings of two Indian cottons have been spun on five systems of high draft spinning in addition to the ordinary system. This investigation is in progress.

(3) *Effect of balanced and unbalanced drafts on mixings.*—For the purpose of this investigation mixings were made, in different proportions from P.A. 289F with P.A. 4F, Mollisoni with P.A. 4F and Kampala with P.A. 4F. Suitable

hank rovings prepared from these mixings were spun with balanced and unbalanced drafts into identical counts and the yarns were examined for strength, evenness, elasticity, etc. This investigation was completed during the period under review and an account of it will be published in the form of a Technological Bulletin.

(4) *Effect of storage of seed-cotton prior to ginning.*—During the period under review this investigation was completed and the results were published in a Technological Bulletin, a summary of which will be found on page 64. The Technological Research Sub-Committee, while considering the report of the work on this subject, decided that these tests may also be performed on Wagad 8 and Punjab-American cottons with the storage period increased to about 4 months.

(5) *Combing of good-quality Indian cottons.*—It was stated in one of my previous Annual Reports that an investigation was undertaken at the Technological Laboratory to find out the limit spinning performance of four good quality Indian cottons when these had been combed to the extent of 20 per cent., and 30 per cent. Alongside of the spinning of fine counts from the combed cottons both on the ordinary system and a high draft system, the comber wastes obtained from these cottons were mixed with low quality cottons and were spun into relatively coarse counts. During the period under review an account of this investigation was written up and published in the form of a Technological Bulletin, a summary of which will be found under " Publications ".

(6) *Comparative tests on the effect of change in the blow-room machinery.*—It has been mentioned above that during the period under review the blow-room plant of the Laboratory was overhauled, some old machines were discarded and new machines were installed. As one of the primary functions of the Laboratory is to undertake tests on agricultural samples from season to season, it is necessary to have information regarding the effect on the spinning performance of any change introduced in the processing plant. For this purpose 8 varieties, covering the full range of staple length of Indian cottons, were selected and were processed both on the old and the new plant. The results of yarn tests on these samples when available will yield the necessary correction factor, if any, which should be applied as a result of the alteration in the blow-room plant.

II. RESEARCH LABORATORY.

Fibre Testing Section.—It is customary at the Laboratory to determine the principal fibre properties of all the agricultural samples on which spinning tests are carried out. Besides this, fibre tests are also made on the standard Indian cottons as well as on the samples which are tested at the Laboratory in connection with its technological investigations. All these tests, which normally involve the determination of mean fibre-length and fibre weight per inch and in some cases that of fibre strength and fibre maturity of cotton, are

carried out in the Fibre Testing Section, which, as a result, was kept fully occupied with these tests. In addition to these comparatively large sized samples, the Laboratory receives a number of small size samples of strains which are as yet in the early stage of experimentation and on which fibre tests are required by the breeders. During the period under review, 95 such samples were received for fibre tests out of which 17 came from the Cotton Research Botanist, Parbhani and 16 from the Senior Assistant Botanist, Mysore State, Bangalore. With the other work involved in making fibre tests on the large sized samples, it was possible to make the fibre tests on only 59 of these small size samples. The following statement gives a description of such samples on which fibre tests were completed during the period under review:—

1. *The East India Cotton Association Ltd., Bombay.*—Fifteen samples of A. R. Kampala, Busoga and Jinja cottons ; one sample of Punjab-American and 2 other samples.

2. *The Cotton Breeder, S. M. C., Dharwar.*—Three samples of cross strains.

3. *The Cotton Breeder, Government Farm, Broach.*—Two cross strains.

4. *Botanist in Sind, Sakrand.*— Four samples of cross strains.

5. *Messrs. Narandas Rajaram & Co., Bombay.*—Two samples of Dabhoi Farm cotton.

6. *The Senior Assistant Botanist, Mysore State, Bangalore.*—Sixteen samples of *Nadam Cernuum* and other cross strains.

7. *The Meyer Sassoon Mills Co., Ltd., Bombay.*—One sample of Amod cotton.

8. *The Director, Institute of Plant Industry, Indore.*—Eight samples of Malvi selections of different growths and picking.

9. *F. D. Nanavati, Esq., Bombay.*—Two samples of Punjab-American cottons.

10. *Messrs. P. Chrystal & Co., Bombay.*—One sample of P. A. 4F and two other samples.

Mr. Hari Rao Navkal, in addition to supervising the work of this Section, has continued his investigation on the effect of twist on the strength and extension of cotton fibre. Mr. Hari Rao has now completed these tests on five cottons covering the short, medium and long staple varieties. As it was felt that sufficient experimental work has been done in connection with this investigation, Mr. Hari Rao is now engaged in analysing the results with a view to publishing them in the near future in the form of a Technological Bulletin.

Physics Section.—Mr. R. S. Koshal continued the analysis of the effect of distribution of rainfall and temperature on the fibre properties and the spinning value of a cotton. For this purpose he has utilised the results of detailed tests carried out at the Laboratory on the standard Indian cottons during the last 10 seasons. Information regarding rainfall and temperature was solicited from the suppliers of the samples and Mr. Koshal has already obtained extremely interesting results. It has been found, for instance, that in cottons like C.A. 9 and P.A. 4F in which large differences were observed in some seasons between the values of the predicted and the actual highest standard warp counts, the inclusion of the rainfall factor brought about a much closer agreement. Mr. Koshal further analysed the results for the three Madras cottons, namely, Nandyal 14, Karunganni C. 7 and Hagari 1 and found that if the rainfall factor were also taken into consideration in addition to length and fibre weight per inch only a very few cases showed a large disparity between the actual and the predicted values. Mr. Koshal is continuing this investigation with respect to the other cottons for which the necessary data is available. Besides doing this work Mr. Koshal is also at present devoting a part of his time to a study of the strength of bundles of cotton fibre. This work is in progress.

Mr. C. Nanjundayya continued his investigation of the rate of absorption of moisture by short, medium and long staple cottons at different humidities. In order to carry out this investigation, an apparatus has been designed at the Laboratory which makes it possible to maintain automatically any humidity between 30 per cent. and 80 per cent. R. H. for any length of time. This apparatus will also be found useful in other investigations of a similar type where it is proposed to keep the cotton fibre or yarn at any desired humidity for any period of time. In addition to this work, Mr. Nanjundayya has undertaken an investigation on the properties of cotton fibre at the point of rupture of yarn.

Dr. K. R. Sen who joined the staff of the Laboratory on 17th May 1935 has undertaken an investigation on the effect of fibre properties of cotton on their "mixing" quality. Hitherto the Laboratory has concentrated its investigations on the effect of fibre properties on the spinning value of a cotton. In actual practice, however, as is well-known, cottons are rarely used in pure form in the mills, where most of the spinnings are made from mixings of two or more varieties. It is therefore important, from a practical as well as a theoretical point of view, to determine what fibre-properties are important from the point of view of the "mixing" quality of two cottons. For this purpose, fibre tests will be made on a series of cottons which will be mixed in different proportions and parallel spinning tests on these mixings will also be undertaken.

Chemistry Section.—Mr. D. L. Sen completed the determination of the wax content of standard Indian cottons which was undertaken to throw light on the differential absorption of dyes by these cottons. Following this work, Mr. Sen continued the study of the differential absorption of different dyes by a number of Indian cottons. He has so far examined the absorption of two dyes by all the standard cottons and of another four dyes by six of these cottons. Besides doing this work, he carried out moisture tests on 26 samples of which an account will be given later.

Microscopy Section.—Mr. A. N. Gulati.—It was stated in one of the previous Annual Reports that an investigation was undertaken at this Laboratory in order to study the relationship between the fibre-maturity and the degree of yarn neppiness of a cotton. For this purpose a large number of cottons were selected and were examined for the percentage of mature, half-mature and immature hairs. During the period under review an account of this investigation was published in a Technological Bulletin, a summary of which will be found under "Publications". Mr. Gulati also continued his investigation on the bacterial and fungoid growth in connection with the deterioration of Broach cotton. For this purpose, he prepared cultures in special media of the various micro-organisms which were found associated with this cotton and was successful in isolating and identifying most of them. Arising from the examination of the Broach cotton stored for nearly a year, he observed a new type of bacterial infection of which no mention appears to have been made by any of the earlier workers on this subject. In this type of infection the bacteria, instead of merely puncturing the walls of the fibre, were found to feed upon the secondary cellulose, working their way gradually along the length of the fibre. Mr. Gulati took several photographs showing this type of bacterial infection and an account of these observations has been sent for publication in the Indian Journal of Agricultural Science. It should also be stated that, in addition to the above work, Mr. Gulati examined numerous samples for fibre-maturity in connection with the routine work of the Laboratory. It is now proposed to hand over the fibre maturity work to the Fibre Testing Section as a part of their normal activity.

Dr. L. Thoria joined the staff of the Laboratory on 1st May 1935. He began work on the possibility of the utilisation of the short staple cottons for the manufacture of artificial silk and staple fibre. For this purpose, Dr. Thoria prepared secondary acetates from samples of cheap short staple Indian cottons, wastes and rags, etc. Films of suitable thickness were prepared from these acetates and their strength and elasticity were determined. These will be compared with films made from other materials.

III. MOISTURE TESTING SECTION.

In view of the fact that in the last three years sufficient data has been collected with regard to the average moisture content of Indian cottons received in Bombay at different times of the year and its variation in the dry and the wet season, only 26 samples were subjected for moisture tests during the period under review. These samples included 7 from the Appeal Committee of the East India Cotton Association, 4 from trade bales and 15 in connection with the Laboratory investigations. The total number of samples so far tested in this Section now amounts to 747, out of which 390 were drawn either from the trade bales or supplied by the Appeal Committee of the East India Cotton Association. Since it was felt that the available results constitute adequate basis for drawing reliable conclusions a final report containing the results of all the tests on samples either drawn from trade bales or supplied by the

Appeal Committee of the East India Cotton Association, was written up during the period under review. This report was considered by the Moisture Tests Sub-Committee of the Association who made their recommendations for standards of moisture to the Board of the Association.

IV. PUBLICATIONS.

The following is a list of Technological Bulletins and Circulars issued during the period under review :—

I. Technological Bulletins, Series A, Nos. 26 and 27.

(1) Technological Bulletin, Series A, No. 26 "Technological Reports on Standard Indian Cottons, 1934" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

(2) Technological Bulletin, Series A, No. 27 "Combing of Good Quality Indian Cottons" by R. P. Richardson, F.T.I., and Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

II. Technological Bulletins, Series B, Nos. 19 and 20.

(1) Technological Bulletin, Series B, No. 19 "Effect of Storage Prior to Ginning on the Spinning Quality of Cotton" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

(2) Technological Bulletin, Series B, No. 20 "Fibre-Maturity in Relation to Fibre and Yarn Characteristics of Indian Cottons" by Amar Nath Gulati, M.Sc., and Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

III. Technological Circulars Nos. 150 to 195, as under :—

Circular No.	Title.	Date of publication.
150	Spinning Test Report (No. 514) on samples of A. R. Kampala, A. R. Busoga, and A. R. Jinja cottons, 1933-34	September 1934.
151	Spinning Test Report (No. 515) on samples of Bijapur cotton, 1933-34	September 1934.
152	Spinning Test Report (No. 516) on samples of Upland cotton, 1933-34	September 1934.
153	Spinning Test Report (No. 517) on samples of Karunganni cotton, 1933-34	September 1934.
154	Technological Report on Verum 262 (Nagpur), 1934-35 ..	December 1934.
155	Technological Report on Verum 262 (Akola) 1934-35 ..	December 1934.
156	Technological Report on Umri Bani, 1934-35	January 1935.
157	Technological Report on Punjab-American 289F, 1934-35.	January 1935.
158	Spinning Test Report (No. 559) on samples of C. P. No. 1 cotton, 1934-35	February 1935.

Circular No.	Title.	Date of publication.
159	Spinning Test Report (No. 560) on samples of Berar cotton, 1934-35	February 1935.
160	Spinning Test Report (No. 561) on samples of Khandesh cotton, 1934-1935	February 1935.
161	Spinning Test Report (No. 566) on samples of Khandesh cotton, 1934-35	February 1935.
162	Spinning Test Report (No. 567) on samples of Moglai cotton, 1934-35	February 1935.
163	Spinning Test Report (No. 568) on samples of Bengals cotton, 1934-35	February 1935.
164	Spinning Test Report (No. 570) on samples of Ujjain (Ujjain) cotton, 1934-35	February 1935.
165	Spinning Test Report (No. 571) on samples of Ujjain (Mandsaur) cotton, 1934-35	February 1935.
166	Spinning Test Report (No. 577) on samples of Hubli Kumpta cotton, 1934-35	March 1935.
167	Technological Report on Gadag 1 (Dharwar-American) 1934-35	April 1935.
168	Spinning Test Report (No. 582) on samples of Latur cotton, 1934-35	April 1935.
169	Spinning Test Report (No. 583) on samples of Nanded cotton, 1934-35	April 1935.
170	Spinning Test Report (No. 584) on samples of Muttia cotton, 1934-35	April 1935.
171	Spinning Test Report (No. 591) on samples of Broach cotton, 1934-35	June 1935.
172	Spinning Test Report (No. 592) on samples of Jagadia cotton, 1934-35	June 1935.
173	Spinning Test Report (No. 593) on samples of Punjab-American cotton, 1934-35	June 1935.
174	Spinning Test Report (No. 595) on samples of Bailhongal cotton, 1934-35	June 1935
175	Spinning Test Report (No. 596) on samples of Broach cotton, 1934-35	June 1935.
176	Spinning Test Report (No. 597) on samples of Karun-ganni cotton, 1934-35	June 1935.
177	Spinning Test Report (No. 598) on samples of Tiruppur Cambodia cotton, 1934-35	June 1935.
178	Spinning Test Report (No. 599) on samples of Northern Cambodia cotton, 1934-35	June 1935.
179	Spinning Test Report (No. 600) on samples of Farm Westerns cotton, 1934-35	June 1935.
180	Spinning Test Report (No. 601) on samples of Westerns cotton, 1934-35	June 1935.
181	Spinning Test Report (No. 602) on samples of Miraj cotton, 1934-35	June 1935.
182	Spinning Test Report (No. 603) on samples of Nandyal cotton, 1934-35	June 1935.
183	Spinning Test Report (No. 604) on samples of Surat cotton, 1934-35	July 1935.
184	Spinning Test Report (No. 606) on samples of Tiruppur Cambodia cotton, 1934-35	July 1935.
185	Spinning Test Report (No. 607) on samples of African Busoga cotton, 1934-35	July 1935.

Circular No.	Title.	Date of publication.
186	Spinning Test Report (No. 608) on samples of Kampala cotton, 1934-35	July 1935.
187	Spinning Test Report (No. 609) on samples of Hubli Upland cotton, 1934-35	July 1935.
188	Technological Report on Punjab-American 4F, 1934-35.	July 1935.
189	Technological Report on Surat 1027 A.L.F., 1934-35 ..	July 1935.
190	Spinning Test Report (No. 612) on samples of Kalagin cotton, 1934-35	July 1935.
191	Spinning Test Report (No. 613) on samples of Farm Westerns cotton, 1934-35	July 1935.
192	Technological Report on Jayawant (Kumpta) cotton, 1934-35	August 1935.
193	Technological Report on Cambodia Co.2 (Cambodia 440), 1934-35	August 1935.
194	Spinning Test Report (No. 620) on samples of Navsari cotton, 1934-35	August 1935.
195	Spinning Test Report (No. 621) on samples of Upland cotton, 1934-35	August 1935.

The following is a summary of Technological Bulletins, Series A, No. 27 and Series B, Nos. 19 and 20 :—

(1) *Technological Bulletin, Series A, No. 27 "Combing of good-quality Indian Cottons".*—The present bulletin describes the results of combing tests carried on four good quality Indian cottons, namely, P.A. 289F, Cambodia Co. 1, Nandyal 14 and Surat 1027 A.L.F. These cottons were combed on a Nasmyth Comber to the extent of 20 per cent. and 30 per cent. (27 per cent. in the case of 1027 A.L.F. for the higher degree of combing). The resulting slivers were spun on the ordinary and a high draft system of spinning into counts much finer than those permissible for the carded material. The comber wastes in each case were mixed, in the proportion of 1 : 3 with a low quality cotton grown in the same province and the good quality cottons and the mixtures thus obtained were spun into suitable counts on the ordinary sytem. The behaviour of each sample during spinning was noted and the yarns obtained were examined for evenness, neppiness and strength. In the course of this investigation 103 different spinnings were carried out, giving rise to 1,004 bobbins for tests. The number of lea tests performed amounted to 4,957, that of ballistic tests 4,870 and that of single thread tests 10,040, making a grand total of 19,867 tests for yarn strength alone. Besides these, the low quality cottons, the comber wastes and the carded and the combed slivers of the good quality cottons were subjected to fibre tests for the determination of mean fibre-length, fibre-length irregularity and fibre-weight per inch. From a consideration of the results of all these tests the following conclusions are arrived at :—

1. The mean fibre-length of the combed material, for each of the four cottons, was either equal to or only slightly higher than that of the carded

material. The process of combing, therefore, even to the extent of 30 per cent. did not bring about a large increase in the mean fibre-length of any of these cottons.

2. The process of combing, on the other hand, was remarkably effective in reducing the fibre-length irregularity of these cottons. The improvement in this direction was most pronounced in the case of the cotton (P.A. 289F) which had the highest value of fibre-length irregularity. Thus, the combed cottons were only slightly longer but much more regular in length than the carded cottons.

3. The 20 per cent. comber waste was found, in each case, to be about 15 per cent. shorter than the cotton from which it was extracted. Its fibre-length irregularity percentage was, however, independent of the cotton, being nearly 24 in each case. The 30 per cent. comber wastes, were, on the whole, somewhat longer and less irregular in length than the 20 per cent. comber wastes, but, unlike the latter, their mean fibre-length did not bear any straight-forward relationship to that of the cotton, nor their fibre-length irregularity was confined to a narrow range.

4. The hair weight per inch of the comber wastes was either very nearly equal to, or a little higher than that of the carded material depending upon the botanical variety of the cotton.

5. Yarn breakages on the ring frame were, on the whole, less on the high draft than on the ordinary system thus making it possible to spin within the economic limit finer counts on the former system.

6. The process of combing considerably reduces, though does not completely eliminate, neppiness in cottons in general and is most effective in the case of such cottons as P.A. 289F which ordinarily give rise to neppy yarns.

7. When the low quality cottons were mixed with the comber wastes, the yarns obtained from the mixtures were in each case more neppy than those spun from pure cottons, though in no case were they so neppy as to be unserviceable. Besides the neppiness content of a cotton and a comber waste, other factors, such as the capacity of the two to mix together, operate in determining the neppiness of the yarns obtained from the mixture.

8. The system of spinning, ordinary or high draft, made no difference to the degree of neppiness of the yarns.

9. Though the yarns spun from the combed cottons were much finer than those obtained from the carded cottons, they were, on the whole, quite satisfactory from the point of evenness.

10. The high draft system gave more even yarns than the ordinary system, the improvement in this respect being more marked in the carded than in the combed yarns.

11. The effect of a comber waste in determining the evenness class of yarns spun from its mixture with a pure cotton depends upon the spinning quality of the former as compared to that of the latter. Where the two are very nearly equal, the yarns spun from the mixture are just as even as, or only very slightly less even than, those obtained from the pure cotton. Where, on the other hand, the waste is of a definitely poorer quality than the pure cotton, the yarns obtained from the mixture are appreciably less even than those spun from the pure cotton.

12. Combing to the extent of 20 per cent. made a very considerable improvement in the spinning quality of each of these cottons, so that it was possible to spin 50's and 60's yarns from cottons which are ordinarily regarded as suitable for spinning up to a maximum of 30's warp. The response to the combing treatment, however, was different for the different cottons, and it was found that for these four cottons at least the percentage improvement in spinning quality followed the order of the mean fibre-length of the cottons.

13. In practically all cases the high draft system yielded stronger yarns than the ordinary system, the increase in strength, however, was more pronounced in the case of some cottons than in that of others. It was also more marked in the finer than in the relatively coarser counts.

14. In the case of three cottons the beneficial effects of (1) combing to the extent of 20 per cent. and (2) spinning on the high draft system were found to be additive, while in the fourth case in which the effect of the 20 per cent. combing alone was very large, it was not the case.

15. Whereas combing to the extent of 20 per cent. raised the capacity of these cottons to spin into finer counts by a very considerable amount, combing to the extent of 30 per cent. did not *in all cases* confer a benefit commensurate with the additional loss of 10 per cent. fibres. The use of the higher degree of combing may not, therefore, prove an economic proposition in every case. As to when combing should be advantageously pushed up to 30 per cent. and when it should be left at 20 per cent. depends upon the system of spinning employed and the variety of cotton under test. In connection with the latter point, it was found that if 20 per cent. combing produced very large improvement in the spinning quality of a cotton, combing to the extent of 30 per cent. did not appreciably raise its spinning performance. If, on the other hand, the initial improvement resulting from 20 per cent. combing is not so large, there is room for further improvement in spinning quality by extracting 30 per cent. fibres.

16. 20 per cent. combed cottons spun on the high draft system gave very nearly the same results as those obtained for the 30 per cent. combed cotton spun on the ordinary system. Thus, where the high draft system used in these tests is or can be made available, it would be more economical to comb the cotton only to the extent of 20 per cent. and employ the high draft system in their spinning rather than push the combing to 30 per cent. and use the ordinary system.

17. The main causes for the very considerable improvement in the spinning value of a cotton consequent upon combing must be sought in factors other than a mere increase in mean fibre-length, these factors being primarily a more regular disposition and greater length uniformity of the fibres in the combed material.

18. Employing a special technique no difficulty was experienced in obtaining yarns from mixtures of comber wastes and low quality cottons. In the case of three cottons the yarns spun from the mixtures were somewhat weaker than those given by the pure cottons, showing that comber waste was poor in spinning quality than the pure cotton. In the fourth case the yarns spun from the mixtures were just as strong as those obtained from the pure cottons.

19. Only in the case of one cotton—P.A. 289F—the yarn strength results of the 30 per cent. comber waste mixture were definitely better than those for the 20 per cent. waste mixture. In the case of the other three cottons the differences in yarn strength between the two waste mixtures were generally not large.

(2) *Technological Bulletin, Series B, No.* 19, *" Effect of storage prior to ginning on the spinning quality of cotton.*—The object of this paper is to describe the results of an experiment carried out specifically with the object of ascertaining the influence of storage of seed-cotton upon the fibre-properties and spinning quality of cotton. No attempt was made to determine the damage done to the fibres by bacterial and fungoid growths, as this part of the ground has already been traversed by other workers. The three cottons selected for these experiments are improved varieties grown in the Punjab and are called Punjab-American 289F, Punjab-American 4F and Mollisoni.

It was found that storage of cotton in seed for four weeks before ginning has no effect whatever either upon its mean fibre-length or fibre-weight per inch. The results of these tests, thus, do no support the view that the development of the cotton fibre continues after picking during the period of storage of seed-cotton. Similarly, the other view that during storage oil diffuses from the seed into the fibre is not confirmed by the results of wax determination. Only in the case of one cotton, P.A. 289F, the wax content of the stored sample was found to be significantly higher than that of the early-ginned sample. As against this, P.A. 4F gave just the opposite result, the wax percentage of the stored sample being actually *less* than that of the sample ginned immediately after picking, while the difference between the values of wax content for the two types of samples of the third cotton, Mollisoni, was negligible.

•The results of the spinning test show that the yarns spun from the sample of P.A. 289F, which was stored before ginning for four weeks, were stronger and more even than those given by the early ginned sample of the same cotton. This feature, again, was not shared by the other two cottons which gave similar results for the two types of samples except in 6'sA counts of one cotton—Mollisoni—where the stored sample had the advantage.

Thus, in the case of two cottons, storage of seed-cotton before ginning did not bring about any improvement whatever in fibre-properties, wax content or spinning performance, while it held the possibility of severe loss due to bacterial deterioration. In the case of one cotton only a small improvement in wax content and spinning performance was observed, but it would be rash to regard it as an argument in favour of delaying the ginning operation and to ignore the harmful effects of storage upon the quality of the seed and lint. If, by force of circumstances, it may become necessary to store the seed-cotton for a while before ginning, every precaution should be taken to ensure that the sample is dry, that it does not contain large quantities of dirt or trash and that the atmosphere in the store-room is neither particularly warm nor humid. If the period of storage should exceed a few weeks, the seed-cotton should be occasionally taken out and exposed to sun.

(3) *Technological Bulletin, Series B, No. 20, "Fibre Maturity in Relation to Fibre and Yarn characteristics of Indian cottons.*—The present report contains an account of an investigation undertaken with the object of determining the effect of season, locality of growth, heredity, etc., on the fibre-maturity of Indian cottons, the relationship of the latter with the mean-length, fibre-weight per inch and fibre-strength of these cottons and its influence on the neppiness and strength of the yarns spun from them.

The technique employed in these tests is described in detail. The following conclusions are drawn from an analysis of the observed data :—

(1) Different cottons behave differently in regard to the effect of season on fibre-maturity ; in some the maturity is subject to seasonal fluctuation, in others the season has very little effect.

(2) The locality of cultivation has a pronounced effect on the degree of fibre-maturity of Banilla cotton.

(3) Selections from the same common parents grown under similar conditions may differ significantly in regard to fibre-maturity.

(4) The saw-gin does not exercise any selective action on the immature or half-mature fibres. If, as in the present case, the saw-ginned samples are found to give more neppy yarns, it is possibly due to the rolling up of the short bits into which some of the longer fibres may break during their passage through the gin.

(5) Fibre-maturity did not yield a significant simple correlation with mean-length but detailed analysis shows that a majority of short staple cottons possess high percentages of mature hairs, while a majority of the comparatively long-staple cottons are characterised by low percentages of mature hairs.

(6) High fibre maturity goes hand in hand with high fibre-weight per inch and high fibre-strength, the simple correlation coefficients between the two attributes being $+0.60$ and $+0.72$ respectively. The mature fibres

are so definitely stronger than the immature ones, that, in every case, the lower quartile for the former is greater than the upper quartile for the latter.

(7) Yarn-neppiness is significantly correlated to the number of immature hairs in a cotton, the values of simple and biserial correlation coefficients for 31 samples being + 0.49 and + 0.81 respectively.

(8) Other factors such as the proportion of half-mature hairs and the type of gin employed, which may be responsible for causing yarn-neppiness are considered. On making due allowance for these factors, the simple correlation coefficient between yarn-neppiness and the combined percentage of immature and half-mature hairs is found to be + 0.67 for 28 samples.

(9) The influence of such factors as (*a*) fuzz and matted fibre, (*b*) the dispersal of some immature fibres in the even (nep-free) yarn, (*c*) the presence of some mature hairs in the neps, and (*d*) the difficulty of ascertaining accurately the number of neps, in lowering the observed correlation coefficients is considered.

(10) The influence of fibre-maturity on the spinning value of a cotton is found to be masked by the other fibre-properties, notably mean fibre-length and fibre-weight per inch. On making a detailed analysis it was found that, in medium and long-staple cottons, higher fibre-maturity is usually associated with better spinning performance, while in short staple cottons the reverse is the case, the relative simple correlation coefficients for the two classes of cottons being + 0.56 and — 0.66 respectively. The importance of taking into account maturity percentages, in addition to other fibre-properties, in judging the quality of a cotton is discussed.

V. GENERAL.

The work of the extension of the Spinning Laboratory block as sanctioned by the Committee was begun on the 5th January 1935 and was completed on the 30th April 1935. The first step in this direction was the acquisition of more land for the Laboratory, as not only the available building area on the present site was insufficient for the proposed extensions but the building activity in the surrounding area made it necessary to look to future needs of the Laboratory. In order to make room for the new blow-room plant the blow-room was extended in length by about 30 feet. For this purpose, the old cotton samples room was merged into the blow-room and a new samples room was built contiguous to it. The new samples room is bigger than the old one as the number of samples which have to be stored now is much greater than in the past. Furthermore, in view of the congestion in the spinning room, two new rooms were built contiguous to it. To one of these the gins and the *kapas* opener, which had so far been in the spinning room were transferred, while the other was fitted up for work on the utilisation of short staple cottons for the production of artificial silk to which a reference has already been made.

The Yarn Testing Room had also become highly overcrowded owing to the rapid increase in the work of the Laboratory and was extended in length by about 22 feet. The humidifying ducts leading to this room were also suitably extended so as to maintain the enlarged room at the proper humidity. The extension of the Yarn Testing Room necessitated the demolition of the old boiler house and a new one was built for this purpose. Furthermore, as it was felt that the whole compound of the Laboratory consisting of the old site and the newly acquired plots should be protected by one enclosure wall, the present walls on the east and west side were extended and a new wall was built on the north side. All these extensions were completed on the 25th May 1935 and were formally opened in the presence of the President, Vice-President, local members of the Committee and prominent representatives of trade and industry on the 29th May 1935. The total cost of the extensions including the buildings, machinery, etc., but excluding the cost of the new plots, came to Rs. 40,400.

Staff.—The staff of the Laboratory, as on the 31st August 1935, was as follows :—

Director.—Dr. Nazir Ahmad, M.Sc., Ph.D., F.Inst. P.

RESEARCH LABORATORY.

Physics Section :—

Senior Research Assistants.—Hari Rao Navkal, M.Sc. ; Ram Saran Koshal, M.Sc.

Junior Research Assistants.—C. Nanjundayya, M.Sc. ; Dr. K. R. Sen, D.Sc.

Senior Testing Assistant.—S. S. Sukthankar, L.T.C.

Junior Testing Assistants.—K. G. Deo ; C. S. Ramanathan, B.Sc. ; R. G. Panvalkar, B.Sc. ; S. Samson, B.Sc. ; M. R. Raut, M.Sc.

Chemistry Section :—

Senior Research Assistant.—D. L. Sen, M.Sc., Tech., M.Sc., A.I.I.Sc., A.I.C.

Temporary Chemist.—Dr. L. Thoria ; Dr. Inge (Germany).

Microscopy Section :—

Junior Research Assistant.—A. N. Gulati, M.Sc.

Draughtsman.—B. G. Mehta.

Instrument Maker.—J. B. Kharas.

SPINNING LABORATORY.

Spinning Master.—R. P. Richardson, F.T.I.

Spinning Assistant.—N. Iyengar.

Electrician.—Herculano Lobo, L.E.E.

Clerk.—D. C. Mullan.

Yarn Testing Section :—

Statistician and Personal Assistant.—V. Venkataraman, M.A.

Senior Testing Assistant.—H. B. Joshi, B.Sc.

Junior Testing Assistants.—G. D. Bhide, B.Sc.; K. V. N. Nayar; V. N. Modak, B.Sc.; L. V. Sundararaman, B.A.; P. S. Sambamurthi; G. J. Kharkar, B.Sc.; A. J. Farid; U. K. Benegal, B.A.; P. V. Nachane, B.Sc.; A. B. Khan, B.Sc.

Statistical Clerks.—R. Krishna Iyer; P. K. Wagle.

DIRECTOR'S OFFICE.

Head Clerk.—M. T. Majmudar.

Stenographers.—M. T. Sundaram; M. A. Marar.

Laboratory Keeper.—H. P. Sethna, B.Sc.

Mr. R. P. Richardson, Spinning Master, proceeded on leave out of India on the 10th September 1934 and returned to duty on the 11th January 1935. During this leave period, Mr. N. Iyengar, Spinning Assistant, was appointed to officiate as Spinning Master.

Mr. M. M. Patke, Instrument Maker, resigned his post from the 15th February 1935 and this post was filled up by the appointment of Mr. J. B. Kharas on a revised scale of pay. Mr. Kharas joined the Laboratory on 18th February 1935.

In order to cope with the increased work in the Fibre and Yarn Testing Sections of the Laboratory, two posts of temporary Junior Testers were created for a period of four months each. These were filled up by Messrs. G. Hurry and C. A. S. Iyer who worked in the Laboratory from 10th December 1934 to 9th April 1935.

Due to the resignation of Mr. D. F. Kapadia, Mr. R. S. Koshal was confirmed in the permanent post of Senior Research Assistant and Dr. K. R. Sen, Technological Assistant at Lyallpur, was appointed to the vacant post of Junior Research Assistant on a revised scale of pay. Dr. Sen joined his duties at the Laboratory on the 17th May 1935.

Mr. K. S. Marar, Junior Tester, who was appointed Technological Assistant, Sakrand, was relieved on the 30th April 1935 to join his new post and his post was filled up by the appointment of Mr. C. S. Ramanathan, who joined the Laboratory on the 4th June 1935.

Mr. K. G. Deo was transferred to Lyallpur as Officiating Technological Assistant to relieve Dr. K. R. Sen. He worked there till relieved by Mr. S. Raja Raman, M.Sc., who was appointed as Technological Assistant, Lyallpur. Mr. Raja Raman was given the necessary training in the Laboratory prior to taking over the charge of his duties at Lyallpur. He completed his training on the 11th September 1935 and proceeded to Lyallpur to relieve Mr. K. G. Deo, who reverted to his substantive post of Junior Tester in the Laboratory.

Mr. M. A. Gangat, Junior Tester, resigned his post on the 22nd May 1935 to take up an appointment under the Department of Industries, Bombay. This post was filled by the appointment of Mr. M. R. Raut, M.Sc., who joined his duties on the 10th June 1935.

In connection with the investigation on the possibility of the utilisation of short staple cottons for the manufacture of artificial silk and staple fibre, a temporary post of a Chemist was created for one year and Dr. L. Thoria was appointed to this post. He joined the Laboratory on the 1st May 1935.

As in the past, two students from outside, *viz.*, Messrs. P. H. Bhutta and V. S. Matkar were selected for training at the Laboratory from 1st December 1934 for a period of six months. Their period of training expired on the 31st May 1935.

During the period under review, the writer was elected a Fellow of the Institute of Physics, London, and a Fellow of the Indian Academy of Sciences, Bangalore. He was also nominated by the Government of Bombay as a member of the Board of the Victoria Jubilee Technical Institute, Matunga, and a Fellow of the University of Bombay.

Mr. D. L. Sen, Senior Research Assistant, was sanctioned by the Committee one year's study leave outside India and he left India on the 20th September 1935 to join the College of Technology, Manchester.

The temporary post of Personal Assistant was extended for a further period of one year and Mr. V. Venkataraman continued to hold that post in addition to his own duties.

Mr. H. B. Joshi continued to be in charge of the Yarn Testing Section.

The Indian Central Cotton Committee at its meeting held on the 4th February 1935 while reviewing the work of the Laboratory desired that a brochure containing an account of the past work of the Laboratory be written up by the undersigned together with a programme of work for the future. The brochure and the programme were considered by the Committee at its

meeting held on the 20th August 1935 and it was decided that the brochure should be published for the information of the public.

As in the past the Laboratory has continued to attract a large number of visitors. These included prominent men, people connected with the textile trade and industry, students of agricultural, commerce and technical colleges, etc. It may also be stated here that the Laboratory possesses a small but well-equipped Library of its own. The Library contributes to most of the leading journals devoted to textile research and every effort is made to keep it up to date.

Equipment.—During the period under review, the following machines and apparatus were added to the equipment of the Laboratory :—

Machines :—

(1) Horizontal opener cleaner.

(2) Cage Exhaust.

(3) New Hopper Feeder with three step cone pulleys.

(4) Improved dust trunks with vibrating grids.

(5) Two cyclones.

All the machines were supplied by Messrs. Tweedales and Smalley (1920) Ltd., Castleton, Rochdale. In addition, the old hopper feeder has been provided with strong upright and evener lattices and the old Crighton opener with new triangular grid bars and new sets of blades. The scutcher has now been equipped with a variable speed motor in which the beater speed can be varied from 500 to 1000 r.p.m. Another important feature of the present blow-room is the provision of a bye pass by means of which the Crighton opener can be thrown out in the case of clean cottons for which a milder blow-room treatment is regarded sufficient.

(6) Two new Electric motors one of 8½ H.P. and the other of 13 H.P., supplied by the Asea Electric Limited, Bombay.

(7) One Brunswiga Calculating Machine.

Apparatus :—

(1) Single Yarn Twist Tester manufactured by the Fine Cotton Spinners' and Doublers' Association, Rock Bank, Bollington, Cheshire.

(2) One Strength Tester with graphic recorder manufactured by Louis Schopper, Leipzig, Germany, for artificial silk work.

(3) One Electric Oven by Messrs. Baird and Tatlock (London) Limited.

ACKNOWLEDGMENTS.

In presenting this report I wish to express my gratefulness to the office-bearers of the Indian Central Cotton Committee for the deep and sympathetic interest they have uniformly taken in the work of the Laboratory, to the East India Cotton Association, to Major Ellis Jones and Messrs. C. P. Bramble and Varjivandas Motilal for the supply and valuation of samples and to the entire staff of the Laboratory for their loyal co-operation which made the work possible.

NAZIR AHMAD,

Director,

Technological Laboratory.

Dated the 9th November 1935.

CHAPTER VII.

REPORT OF THE PUBLICITY AND PROPAGANDA OFFICER FOR THE YEAR ENDING 31ST AUGUST 1935.

INTRODUCTION.

THE past year was one of sustained progress for the Propaganda and Publicity Department. The vital contact that the Department maintains between the activities of the Indian Central Cotton Committee on the one hand and the needs and interests of the cultivator, general public and government departments on the other was widened and deepened. The Department's activities were not exhausted by the publication and broadcasting of information. Important as this side of its activities was, the more vital purpose was to act as a sensory nerve keeping in live touch with the increasing requirements of the cotton world, and assisting the Committee to direct its work along the most fruitful channels.

Cotton interests not only in India but those outside drew upon the resources of the Department and the contact established during the last few years between the Committee and organisations in England and Japan continued unbroken. Through this Department the efforts of the Lancashire Indian Cotton Committee to increase the off-take of Indian cotton and thereby to promote the cotton trade between the two countries obtained wide publicity throughout India.

PINK BOLL-WORM CONTROL EXTENSION CAMPAIGN IN THE UNITED PROVINCES.

The most notable event during the period under report was the province-wide campaign conducted by the Publicity Officer for the extension of control measures of the pink boll-worm, a pest of cotton which in one year caused a loss of nearly 2½ crores of rupees to the crop in the United Provinces, and the enquiry connected therewith for the purpose of finding out what amount of cess should be levied to meet the cost of heating machines, their installation and working expenses, etc. The campaign extending over three months from the beginning of the year was preceded by two brief visits of a fortnight's duration each time paid to the experimental area with a view to study the effect of sun heating of the village stocks of cotton seed (*binaula*) in the areas then under pink boll-worm control in the districts of Aligarh, Saharanpur and Bijnor and later on to see the results of the heating process at the commencement of the harvest. The decided superiority of the crops in the treated area over the adjacent uncontrolled area both in regard to the stand of the plant, the opening of the bolls and the quality and quantity of the lint produced, by comparing the yield per acre,

and the price realised, convinced me of the efficacy of the method of sun-heating the seed for completely destroying the pest which had resulted in a considerable improvement of the crop to the thorough satisfaction of the grower, and of the vital necessity of extending the control measures.

Demonstration at the Council Hall, Lucknow.

A noteworthy feature of the campaign was the staging of a special demonstration illustrative of samples of cotton, which were supported and explained by printed labels, charts and graphs relating to the scheme, in the Council Hall of the Legislative Council of the United Provinces. Considerable impetus to the focussing of attention of the members on the importance of adopting the scheme of Pink Boll-Worm Control Extension was imparted by the organisation of demonstration on the 11th and 12th and again on the 20th of March, at a time when the session was in progress. The members were taken round the exhibits whereafter there was a conference. The Pink Boll-Worm posters in English, Hindi and Urdu attracted much attention. Questions relating to the loss caused by the pest and the striking gain that had resulted in the quality and quantity of *kapas* of the areas where control methods had been applied were freely asked and answered.

In taking stock of the extensive and thorough propaganda campaign in the United Provinces which closed in the middle of April, the following observations and accomplishments may be of interest :—

(1) Local interests all over the province were notified of my visit and a well-planned propaganda campaign commencing several weeks in advance of my visit to the station was found most effective. A circular letter stating the object of the campaign and the purpose of the enquiry connected therewith was mailed to all notable persons from the Entomologist's office at Cawnpore. This made the task of organising province-wide meetings and/or obtain personal interviews with the co-operation of the civil authorities more thorough. Nothing was left to chance as regards eliciting the views of those I met. Hundreds of meetings and conferences were held in townships and villages.

(2) In advance of and during the campaign there were sent out numerous circulars of informations giving facts regarding improvements carried out as the result of sun-heating the seed and other information necessary. A Pink Boll-Worm Bulletin giving the main features of the scheme of extension was written incorporating control measures.

(3) A ten-colour poster to further the campaign was likewise prepared.

About 5,400 leaflets and 1,400 posters were issued to growers, merchants, ginners and other men of influence.

(4) The campaign brought together men from all interests concerned with cotton industry and others indirectly allied with it with one object in mind, and that is to protect the crop from the ravages of the pest and avoid the collosal preventible loss caused by it.

Excellent co-operation was extended to the Publicity Officer by all interests concerned—the Department of Agriculture, United Provinces, *Zamindars*, businessmen, ginners and other allied interests. Newspaper publicity was carefully handled in order to prevent undue alarm in those districts of the province where propaganda in favour of the scheme had not been carried out. At the same time sufficient information was disseminated in the affected areas to focus attention and secure action from farmers whose crops were menaced, and their representatives in the Legislative Council.

This vigorous Pink Boll-Worm Extension Campaign has, I think, remarkably succeeded in bringing to the attention of the interests concerned and the public the real necessity of tackling the problem and the benefits which will accrue to the cotton crop of the United Provinces by so doing.

A 46-page report of the tour and enquiry in the United Provinces has been submitted to the Government of the United Provinces. Copies were placed on the table for members' information during the last half-yearly meeting of the Indian Central Cotton Committee.

Press Communiqués.

During the year under report the Publicity Officer issued the following press communiqués :—

(1) *The Reports of the 29th and 30th meetings of the Indian Central Cotton Committee.*

(2) *Development of Cotton Growing in Sind.*

(3) *Development of Cambodia Cotton in Coimbatore District.*

(4) *Development of Cotton Cultivation in Central Provinces.*

A press note was issued on "*Facilities for training at the Technological Laboratory, Matunga*", to bring to the notice of the public that the Technological Laboratory would admit this year two students for training in the elements of spinning and the routine methods of testing cotton fibre and yarn.

(5) *Combing of Good Quality Indian Cotton.*

(6) *Effect of Storage prior to Ginning on the Spinning Quality of Cotton.*

(7) *Development of Cotton Growing in the Bombay Presidency.*

Special Articles.

The Publicity and Propaganda Officer has been sending out special articles to the press. These articles are in a language easily understood by the layman and contain much timely information. Through them the wider public is kept constantly in touch. The following articles based on literature already available were contributed and published :—

(1) *Problems of Cotton Growing in the Central Provinces and Berar.*—(Published in *Hitavada*, Nagpur, and the *Civil & Military Gazette*, Lahore.)

(2) *Improving the Indian Cottons.*—(Published in *Textile Weekly*, Manchester.)

(3) *Improvement of Broach Cotton.*—(Published in *Textile Mercury & Argus*, Manchester.)

(4) *Survey of Commercial Indian Cottons.*—(Published in *Current Science*, Bangalore.)

(5) *Yarn Testing and Its Importance to Cotton Mills.*—(Published in *Indian Textile Journal*, Bombay.)

(6) *High Draft Systems of Spinning and Their Importance to Trade.*—(Published in *Indian Textile Journal*, Bombay.)

(7) *Cotton—India's Greatest National Industry.*—(Published in *Indian Textile Journal*, Bombay.)

(8) *Promotion Activities with Respect to India's Cotton Production this Year and thereafter.*—(Published in *Cotton Trade Journal*, America.)

The last article formed a special feature of the Annual International Edition of the *Cotton Trade Journal*, America. This is creditable inasmuch as the journal is the foremost cotton journal in the world.

Pamphlets.

The Publicity and Propaganda Department continued to regard as its prime function the dissemination of the results of scientific cotton research through the medium of publications and distribution of publicity literature—pamphlets, leaflets, handbills and articles to the press. During the period under report the following pamphlets and leaflets were issued :—

(1) *Pink Boll-Worm Pest of Cotton and How to Control It.*—This is an illustrated, finely printed popular pamphlet in English specially prepared for propaganda work in the United Provinces, describing the pink boll-worm pest of cotton and how to control it. It deals

with the life of the pink boll-worm and the injury to the cotton crop caused by the caterpillar larvæ of the moth, *Platyedra gossypiella*, which feeds upon the developing seed inside the cotton boll.

(2) *Summary of the Proceedings of the 29th Half-yearly Meeting of the Indian Central Cotton Committee.*

(3) The pamphlet on "*Pink Boll-Worm Pest of Cotton and How to Control It*" has also been published in the two vernaculars, Hindi and Urdu, the popular languages in the United Provinces. They are also being utilised for the Pink Boll-Worm Control Campaign in the United Provinces.

(4) *Cultivation of Cotton on the Indus Right Bank Areas.*—Promotion of the growth of improved type of Punjab-American cotton (*4F-18*) on the Right Bank section of the river Indus under perennial irrigation assured by the Lloyd Barrage Canals has been going apace with remarkable rapidity. The Publicity and Propaganda Department of the Indian Central Cotton Committee had a large say in the well organised local propaganda effort by suggesting suitable methods of securing effective propaganda and by supplying literature specially prepared to gain the end in view.

A Sindhi edition of this, since brought out, has rendered considerable assistance.

Referring to these publications the Progress Report for the year 1934-35 of the Sind Seed Distribution and Extension Scheme says "A suitable illustrated leaflet in Sindhi and English designed and published by the Publicity Officer of the Indian Central Cotton Committee was widely distributed in the tract . . . . A suitable cotton poster specially designed for the Right Bank Area, issued by the Publicity Officer of the Indian Central Cotton Committee in co-operation with the Chief Agricultural Officer in Sind, was displayed at railway stations, important thoroughfares and public offices. All the above methods of publicity have good effect on the extension of cotton cultivation as will be seen from the extension programme of the work during the current season."

Posters.

During the period under review a striking ten-coloured poster on the pink boll-worm pest of cotton was prepared in English specially for the propaganda campaign in the United Provinces. The poster is self explanatory and deals with the subject which the special pamphlet illustrated. It shows eight small pictures arranged in the margin dealing with the life history and development of the pink boll-worm as also the damage done to the cotton crop by this pest. The central picture is designed to show two cultivators

with cart loads of *kapas*—one stained and the other of good quality, uninfected by the pink boll-worm. There are two buyers also and the conversation between the one cultivator and the buyer and the other pair draws attention to the urgency of heating the cotton seed in a language clear and simple.

Hindi and Urdu versions of the poster have also been prepared. Photographic prints of the poster on " The Pink Boll-Worm Pest of Cotton " prepared for the campaign in the United Provinces were also sent to the press in India and abroad.

A Telugu version of the poster " India's Bid for Supremacy in World's Cotton Markets " was printed for use in the Madras Presidency. The poster deals with the export figures of cotton and emphasises the national and international importance of this commodity.

Exhibitions.

The Department participated in—

(1) The *Exhibitions at Nanded* organised by the Agricultural Department, Hyderabad State, on 30th November and 1st December 1934.

(2) The *Kolhapur Fair* which was held in the 2nd week of May 1935.

(3) The *All-India Exhibition* which commenced on the 15th of December 1934 in Lahore.

(4) The Agent, Japan Cotton Spinners' Association, Bombay, asked for photographs and models showing the various activities of cotton agriculture in India as also the activities of the Indian Central Cotton Committee's Technological Laboratory at Matunga. He further requested for pamphlets for the dissemination of scientific information bearing on problems which the Committee was tackling and posters for use at the *Memorial Exhibition at Formosa (Japan)*. In addition to the supply of publications and posters he was provided with a number of large clear photos on the different sections of the Technological Laboratory.

Heavy Demand on Publicity Literature.

There is a constant demand for free literature dealing with cotton subjects and although supplies are somewhat limited, several thousands of pamphlets, leaflets and other publications are distributed to applicants during the year. In addition to the heavy demand on publicity literature from all over India (including the Indian States) requests are also received from abroad : Mr. A. E. Wilson of Royds Hall, Great Britain, requested a supply of all illustrated publications dealing with cotton growing in India to help him in preparing lantern

slides for a series of lectures he was going to deliver. The Chief, Periodical Division, U. S. Department of Agriculture Library, Washington, requested for press communiques for 1933-34 and other publications of the Department.

APPRECIATIVE REFERENCE TO THE COMMITTEE'S PUBLICITY WORK.

" The Indian Central Cotton Committee maintains its excellent work ", comments the British Cotton Growing Association in their 13th Annual Report (1934), " and several matters of great importance to the industry in India have engaged its attention during the past year. The various reports issued by its Publicity Officer have contained information of much interest and have done good propaganda work in disseminating scientific and practical information relating to the improvement of cotton in India . . . . etc."

R. D. MIHRA,

Publicity & Propaganda Officer.

APPENDIX I.

MEMBERS OF THE COMMITTEE.

(1) PRESIDENT.—

Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.—

Madras	M.R.Ry. Rao Bahadur D. Ananda Rao Garu, I.A.S.
Bombay	The Director of Agriculture.
United Provinces	Mr. R. G. Allan, I.A.S., Director of Agriculture.
Punjab	Mr. H. R. Stewart, I.A.S., Director of Agriculture.
Central Provinces	Mr. J. H. Ritchie, I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture, West Central Circle, Magwe.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS.—

The East India Cotton Association ..	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E., (*Vice-President*).
The Bombay Millowners' Association ..	Mr. S. D. Saklatvala, M.L.C.
The Bombay Chamber of Commerce ..	Mr. A. A. Sarantides.
The Indian Merchants' Chamber ..	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. G. C. R. Coleridge.
The Ahmedabad Millowners' Association ..	Seth Sakarlal Balabhai, M.L.C.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce ..	Mr. J. Tinker.
The Empire Cotton Growing Corporation ..	Mr. W. Roberts, C.I.E.

(5) and (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS.—

Central Provinces	Mr. Y. G. Deshpande. Rao Bahadur G. R. Kothare, M.L.C.
Madras	Mr. J. Nuttall.
Punjab	Khan Bahadur Sardar Habibullah, M.L.C.
Bengal	Mr. Akhil Bandhu Guha.

(7) CO-OPERATIVE BANKING REPRESENTATIVE.—

Rao Bahadur M. G. Deshpande, C.B.E.

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY.—

Madras	Mr. K. S. Ramaswami Gownder. M.R.Ry. Rao Bahadur B. P. Sesha Reddi Garu, M.L.C.
Bombay	Sardar Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Bahadur C. S. Shirahatti.
United Provinces	Khan Bahadur Shah Nazar Husain, M.L.C. Rai Bahadur Lala Anand Sarup, M.L.C.
Punjab	Sardar Sampuran Singh, M.L.C. Mian Nurullah, M.L.C.
Central Provinces and Berar.	Mr. N. M. Deshmukh. Mr. J. B. Deshmukh.

(9) and (10) REPRESENTATIVES OF INDIAN STATES.—

Hyderabad State	Mr. Nizam-ud Din Hyder, Director of Agriculture.
Baroda State	Mr. C. V. Sane, Director of Agriculture.
Gwalior State	Mr. H. H. Pandya, Director of Agriculture.
Rajputana and Central India States.	Mr. F. K. Jackson, Director, Institute of Plant Industry, Indore.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL-IN-COUNCIL.—

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Rao Bahadur S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
3. Dr. V. K. Badami, Ph.D., Deputy Director, Department of Agriculture in Mysore State, Bangalore.
4. M.R.Ry. V. Ramanatha Ayyar Avl., Cotton Specialist, Coimbatore.
5. Musahib-i-Khas Bahadur S. V. Kanungo, Finance Minister, Holkar State, Representative of the Holkar State.
6. Mr. K. I. Thadani, Botanist in Sind, Agricultural Research Station, Sakrand.
7. Seth Isserdas Varindmal, Representative of the Karachi Indian Merchants' Association.
8. Mr. P. B. Richards, I.A.S., Entomologist to Government, United Provinces.
9. Khan Bahadur Nawab Fazl-i-Ali Khan, Chairman, District Board and President, Central Co-operative Bank, Ltd., Gujrat (Punjab).
10. Khan Saheb Farrukhbeg Sadikalibeg Mirza, Nawabshah, Sind.
11. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.
12. Mr. Chellaram Shewaram, Representative of the Karachi Cotton Association, Ltd.

APPENDIX II.

CONSTITUTION OF SUB-COMMITTEES.

STANDING FINANCE SUB-COMMITTEE.

Dewan Bahadur Sir T. Vijayaraghavacharya (*Ex-officio*).

Sir Purshotamdas Thakurdas (*Chairman*).

Mr. S. D. Saklatvala.

Sardar Rao Bahadur Bhimbhai Ranchodji Naik.

Mr. J. Vonesch.

Mr. Chunilal B. Mehta.

Mr. G. C. R. Coleridge.

Rao Bahadur G. R. Kothare.

Mr. A. A. Sarantides.

LOCAL SUB-COMMITTEE.

Dewan Bahadur Sir T. Vijayaraghavacharya.

Sir Purshotamdas Thakurdas.

Mr. S. D. Saklatvala.

Sardar Rao Bahadur Bhimbhai Ranchodji Naik.

Mr. J. Vonesch.

Mr. Chunilal B. Mehta.

Mr. G. C. R. Coleridge.

Rao Bahadur G. R. Kothare.

Mr. A. A. Sarantides.

COTTON GINNING AND PRESSING FACTORIES SUB-COMMITTEE.

Sir Purshotamdas Thakurdas.

Mr. S. D. Saklatvala.

Mr. J. Vonesch.

Mr. Chunilal B. Mehta.

Mr. G. C. R. Coleridge.

Mr. J. Nuttall.

Mr. W. Roberts.

Mr. Y. G. Deshpande.

Vacant (two places).

The Co-operative Representative—Rao Bahadur M. G. Deshpande, and Mr. Chellaram Shewaram—(*Co-opted Member*).

AGRICULTURAL RESEARCH SUB-COMMITTEE.

I. *The President.*—Dewan Bahadur Sir T. Vijayaraghavacharya (*Ex-officio*).

II. *The Vice-President*—(*Ex-officio*).

III. *The Director, Institute of Plant Industry.*—Mr. F. K. Jackson (*Ex-officio*).

IV. *The Co-operative Representative.*—Rao Bahadur M. G. Deshpande (*Ex-officio*).

V. *Cotton Growers' Representative.*—Mr. W. Roberts.

VI. *Cotton Trade Representative.*—Rao Bahadur G. R. Kothare (Co-opted for the August 1935 meeting).

VII. *Four Agricultural Officers.*—Mr. B. S. Patel ; Mr. J. H. Ritchie ; Mr. H. R. Stewart; Mr. V. Ramanatha Ayyar.

VIII. *Additional Members.*—Mr. B. C. Burt, Mr. R. G. Allan ; Mr. K. I. Thadani, (Co-opted for the August 1935 meeting); Rao Bahadur D. Ananda Rao Garu, (Co-opted for the August 1935 meeting); Mr. D. N. Mahta ; Mr. P. B. Richards; Mr. C. V. Sane ; Mr. Chunilal B. Mehta ; Mr. Nizam-ud Din Hyder ; Mr. H. H. Pandya.

IX. *Co-opted Members.*—Mr. Mohammad Afzal; Rai Saheb Kalidas Sawhney ; Mr. J. B. Hutchinson,

and

X. *The Secretary.*

TECHNOLOGICAL RESEARCH SUB-COMMITTEE.

The President (*Ex-officio*).
Sir Purshotamdas Thakurdas.
Mr. B. C. Burt.
Mr. B. S. Patel.
Mr. H. R. Stewart.
Rao Bahadur D. Ananda Rao Garu.
Mr. S. D. Saklatvala.
Mr. Chunilal B. Mehta.
Seth Sakarlal Balabhai.
Mr. J. Tinker.
Mr. A. A. Sarantides.
Mr. Y. G. Deshpande.
Lala Shri Ram.
Dr. Nazir Ahmad.

Mr. A. D. Walwyn, Mr. Dharamsi Mulraj Khatau, (Representing the Bombay Millowners' Association).

Mr. Kasturbhai Lalbhai, Seth Chamanlal G. Parekh, (Representing the Ahmedabad Millowners' Association).

Mr. R. G. Saraiya, Mr. Jamnadas Ramdas, (Representing the East India Cotton Association, Ltd.).

Seth Isserdas Varindmal, (Representing the Karachi Cotton Association, Ltd.).

RESEARCH STUDENTS SELECTION SUB-COMMITTEE.

The President.
The Vice-President.
Mr. B. C. Burt.
Mr. B. S. Patel.
Mr. H. R. Stewart.
Mr. J. H. Ritchie.
Mr. R. G. Allan.
Mr. P. B. Richards.
Mr. F. K. Jackson.
Mr. C. V. Sane.
Mr. H. H. Pandya.
Mr. Nizam-ud Din Hyder.
Dr. Nazir Ahmad.
The Mysore Representative (Dr. V. K. Badami), and
Vacant (two places).

Sub-Committee on Malpractices.

Sir Purshotamdas Thakurdas.
Mr. B. S. Patel.
Mr. G. C. R. Coleridge.
Mr. Chunilal B. Mehta.
Sardar Sampuran Singh.
Seth Sakarlal Balabhai.
Seth Isserdas Varindmal.
Vacant.

Cotton Forecast Improvement Sub-Committee.

The President.

The Director-General of Commercial Intelligence and Statistics, Calcutta.

The Director of Agriculture, Bombay Presidency.

Do. do. Punjab.

Do. do. Madras.

Do. do. United Provinces.

The Chief Agricultural Officer in Sind.

The Director of Land Records, Central Provinces and Berar.

The Director of Agriculture, Baroda State.

The Director of Statistics, H. E. H. the Nizam's Government.

The Deputy Director of Statistics, Calcutta.

Special Sub-Committee on Wider Markets for Indian Cotton.

The President.
The Vice-President.
Mr. B. C. Burt.
Mr. H. R. Stewart.
Mr. J. H. Ritchie.
Mr. B. S. Patel.
Mr. S. D. Saklatvala.
Mr. J. Vonesch.
Mr. Chunilal B. Mehta.
Mr. Y. G. Deshpande.
Mr. R. G. Allan.
Khan Bahadur Sardar Habibullah.
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Rao Bahadur D. Ananda Rao Garu, (Co-opted for the August 1935 meeting).
Mr. Nizam-ud Din Hyder.
Mr. V. A. Tamhane, (Co-opted for the August 1935 meeting).
Mr. Kasturbhai Lalbhai, Mr. R. G. Saraiya, (Co-opted).

STANDARDS SUB-COMMITTEE.

Dr. Nazir Ahmad (Representing the Imperial Council of Agricultural Research).

Mr. Haridas Madhavdas, Mr. Varjivandas Motilal. (Representing the East India Cotton Association, Ltd.)

Mr. M. Napier, Mr. Nechaldas Chhangomal, (Representing the Karachi Cotton Association, Ltd.)

Mr. N. M. Deshmukh, Rao Bahadur G. R. Kothare, (Representatives of cotton growers of Berar Tract.)

Mr. Himatlal Jagjiwandas Vadodaria, Mr. Vadilal Chunilal Doshi, (Representatives of cotton growers of Mathia Tract.)

Mr. Akhubava Takatsinghji Chudasama, Rao Saheb Kevalbhai Desaibhai Desai, (Representatives of cotton growers of Dhollera Tract.)

Mr. Haribhai Jhaveribhai Amin, Mr. Ardeshar Jamshedji Kapadia, (Representatives of cotton growers of Broach Tract.)

Sardar C. B. Naik Bahadur Desai, Rao Bahadur B. L. Patil, (Representatives of cotton growers of Kumpta Tract.)

APPENDIX III.

LIST OF RESOLUTIONS.

" That the International Federation of Master Cotton Spinners' and Manufacturers Associations be informed that the rule was amended at the request of the Committee on the representation of the East India Cotton Association who drew attention to cases of hardships and losses incurred by Bombay merchants because of bales being rejected in arbitration for faults in marking. The chief complaint was that the method of marking as laid down in the original rule was so meticulous that the East India Cotton Association arbitrators had no option but to reject any bales not marked strictly in accordance with the rule though the cotton was in all other respects a fair tender and even at times carrying an ' on ' allowance. Under the circumstances, the Indian Central Cotton Committee regrets it is unable to revert to the original rule."

" The Indian Central Cotton Committee recommends that a minimum balance should be maintained, and that it be Rs. 9 lakhs. There should be no objection, however, to draw upon this minimum balance in case of emergency, provided such shortages are made good as soon as conditions improve."

" The Indian Central Cotton Committee views with alarm the spread of Garrow Hill cotton in the Central Provinces and Berar and strongly recommends to the Central Provinces Government to give immediate effect to Resolution 3 passed at the last meeting of the Central Provinces Provincial Cotton Committee held on the 19th September 1934."

" The Indian Central Cotton Committee views with great concern the increase in the practice of heavy mixing of Punjab-American and *desi* cotton which is taking place this year. The concession for long distance *kapas* transport given by the N. W. Railway and other railways a few years ago has this year, particularly, resulted in accentuating this practice. The concession on the N. W. Railway was, the Committee believes, originally introduced to assist in the marketing of Bahawalpur cotton when ginning arrangements were inadequate. This is not now the case. This Committee wishes to press the Punjab Government to make enquiries and, if possible, to move for the withdrawal of this concession in the general interest of the cotton growers of the province."

" The Indian Central Cotton Committee requests the Government of India to take immediate steps to amend the Cotton Ginning and Pressing Factories Act No. 12 of 1925 so as to protect the interests of the cotton growers in all respects."

" The Indian Central Cotton Committee wishes to place on record its sense of appreciation of the services rendered by Major W. Ellis Jones, extending over a period of ten years, in connection with the grading and valuing of cotton samples received for tests at the Technological Laboratory, and regrets that circumstances now compel him to relinquish this work."

" The Indian Central Cotton Committee wishes to express its appreciation of the efforts made by the Lancashire Indian Cotton Committee to extend the use of Indian cotton in Lancashire as indicated in their first Annual Report and to assure that Committee of its desire to co-operate to the fullest extent possible in all matters affecting the interests of both bodies."

" With reference to Bombay Government's Resolution of the 8th March, the Indian Central Cotton Committee appreciates the fact that the Local Government agree fully with the recommendations of the Chief Agricultural Officer in Sind, namely, that the compact block of long staple cotton in Sind can only be achieved by licensing of gins and presses, use of special marks in the licensed factories, seed supply organisation and organised marketing.

" The Indian Central Cotton Committee now urges Government to translate these recommendations into action with the least possible delay and trusts they will not hesitate to introduce whatever legislation is necessary if the above measures prove inadequate. It further recommends, firstly, that the compact area be reserved for the growth (from specially selected Government seed) of long staple cotton only, such as, *289-F* and *N.T.*, and secondly that the Transport Act be introduced to prevent the importation of *kapas* from outside areas."

" That in view of the fact that the scheme of work on spotted boll-worm control terminates in June 1936, the Central Cotton Committee desires to emphasise the necessity of legislative sanction being obtained before that date to enable the uprooting of cotton stalks to be enforced."

" The Indian Central Cotton Committee requests the Central Provinces Government to reconsider the question of prohibiting the growing of Garrow Hill cotton, as in its opinion the action which the Local Government propose to take, *viz.*, the introduction of legislation to prohibit the sale of mixed cotton as pure, will not prevent the spread of this inferior cotton. The known presence of even small areas of an inferior cotton tends to lower prices in the markets where this cotton is sold and the growers of better quality cotton will also suffer. As the Central Provinces Government has accepted the policy of encouraging the growth of *Verum* cotton in the Central Provinces and Berar, the Indian Central Cotton Committee considers that the growing of Garrow Hill is inimical to that policy and positively detrimental to the interests of the better quality cotton growers and should be discouraged."

" The Indian Central Cotton Committee regrets that the Government of India have not yet passed any orders on the unanimous Resolution of the Committee recommending to the Government of India to resume the broadcasting of cotton rates and hopes that the practice of broadcasting cotton rates will be resumed as soon as possible."

" The Indian Central Cotton Committee welcomes the Bombay Cotton Control Bill which the Bombay Government propose to introduce in the local Legislative Council. The Committee is convinced that unless legislative action of this nature is taken *Goghari* cotton will spread rapidly in the Surat tract and ruin the reputation of *1027 A. L. F.* cotton to the detriment of the cotton growers of the tracts affected."

" The Indian Central Cotton Committee places on record, at this the last meeting of the Committee at which Sir T. Vijayaraghavacharya presides, the uniformly able and efficient manner in which Sir T. Vijayaraghavacharya presided over the Committee for six years. His consistent courtesy to each member and his unrivalled tact and patience in dealing with the various questions that were dealt with by the Committee have been an asset to the Committee.

" The Committee records its best thanks to Sir T. Vijayaraghavacharya for the continued close attention he gave to details of the questions disposed of during this period and it tenders him its best wishes on the eve of his retirement."

APPENDIX IV.

INSTITUTE OF PLANT INDUSTRY, INDORE, CENTRAL INDIA.

Annual Report for the year ending June 30th, 1935.

The Institute of Plant Industry is a Society registered under the Holkar State Societies Registration Act and its primary objects are :—

(*a*) The investigation of all matters relating to the production and improvement of raw cotton in India.

(*b*) The agricultural development of the Indian States which are members of the Society.

(*c*) The training of officers and cultivators nominated by such States.

(*d*) The training of advanced students nominated by the Indian Central Cotton Committee.

Its funds are derived entirely from subscriptions. In the financial year 1934-35 the Indian Central Cotton Committee made a grant of Rs. 1,15,000 and the member States in Central India and Rajputana subscribed Rs. 61,950.

The Institute is subsidised by the Indian Central Cotton Committee primarily in order that it may act as a central research station for the elucidation of botanical and agronomic problems of cotton of too wide a nature to be attacked by *ad hoc* schemes. The Indian Central Cotton Committee has also a secondary interest in the Institute in its work for the improvement of variety and cultivation conditions of cotton in Central India and Rajputana.

The interests of the member States lie in the investigation of the specific crop problems of their own territory and in the development and dissemination of better seeds and more efficient agricultural practices.

The interests of the Indian Central Cotton Committee and of the member States are complementary, and provide a very satisfactory balance to the work of the Institute.

The Governing Body of the Institute is representative of the Cotton Committee and the member States and its President is the Agent to the Governor-General in Central India, *ex-officio*. The Director of the Institute is also Agricultural Adviser to States in Central India and Rajputana, and in addition represents all those States upon the Indian Central Cotton Committee.

Administration and General.

1. *General and Board of Governors' Meetings.*—A General Meeting of Members of the Society was held on December 22nd, 1934, when the constitution was amended so as to make the representation of contributors on the Board of Governors proportionate to the amount paid annually. The Board met on October 6th and on December 23rd when the report for the year ending June 30th, 1934, and the programme for the year 1935-36 were discussed and approved. The Board also sanctioned leave and deputation for Mr. J. B. Hutchinson, Geneticist and Botanist, to allow him to attend the Sixth International Botanical Congress at Amsterdam in September 1935. The Congress having complimented him by their invitation to read a paper in the genetics section, it was felt desirable to enable him also to take advantage of the opportunity of discussion with other geneticists.

2. *Contributing Members of the Institute.*—During the year the State of Jhabua in Central India and the Thikanas of Khetri in Jaipur and Bagli in Gwalior became members. One State, Jhalawar, has temporarily withdrawn from membership for financial reasons.

At the closing date of this report the following twenty-three States and Thikanas were members of the Institute, arranged in order of joining :—

Indore	Tonk	Orchha
Dhar	Bijawar	Bharatpur.
Jaora	Barwani	Jodhpur
Datia	Bikaner	Alwar
Rutlam	Rewa	Khetri
Dewas (Senior Branch)	Jaipur	Bagli
Sitamau	Bundi	Jhabua
Narsingarh	Partabgarh	

The financial situation having become somewhat easier in most States and the Institute's reputation having grown, it is satisfactory to record rather numerous enquiries from States which are not yet members.

On the other hand the Indian Central Cotton Committee, faced with the exhaustion of its accumulated reserves, has found itself unable to continue to sanction annual grants of Rs. 1,15,000 and the Institute's annual income from this source will now be reduced by Rs. 15,000. This serious situation can only be met by further contributions from States or by the dismissal of personnel which will reduce the output of research work.

3. *Staff and Students.*—The Director was absent on leave from March 10th, 1934, to October 18th, 1934, and the Geneticist and Botanist officiated during that period.

The post of Senior Botanical Assistant was filled, after advertising it, by the promotion of Mr. R. L. M. Ghose, M.Sc., who had been Botanical Assistant for some years.

For lack of funds a number of sanctioned posts cannot be filled.

Mr. G. G. Phadke, L.Ag., Junior Farm Assistant, remained on deputation as Agricultural Officer to Bharatpur State.

It is a pleasure to record the keenness and enthusiasm of personnel in all Sections.

4. *Visitors.*—On the 26th July, 1934, the Institute was honoured by the visit of Their Excellencies Sir George and Lady Beatrix Stanley, Viceroy and Vicereine, who spent an hour examining in detail some of the more important of the Institute's achievements and the work in progress.

Among other visitors were the following :—

Amar Singh, Kunwar of Jasol, Director of Agriculture and Grass Farms, Jodhpur State.

Anderson, Jane (Miss), Mission Hospital, Indore.

Ardeshir, Major, D. K., M.R.C.S., Mhow, C. I.

Armstrong, Dr. Allan E., Secretary, United Church of Canada Mission, Toronto, Canada.

Augier, D. E., O.B.E., Joint Opium Officer, Malwa States and Assistant Opium Agent, Neemuch, C. I.

Basu, S., Meteorologist, Poona.

Ben, Mira (Miss), Wardha.

Bhandari, K. L., Rai Bahadur, Managing Director, Nandlal Bhandari Mills, Indore.

Bree, P. G., I.C.S., Excise and Opium Commissioner in Central India and Adviser on Opium Affairs in Rajputana, Indore.

Burnett, Major R. R., Chief Adviser, Tonk State, Rajputana.

Caswell, K. (Miss), Mission Girls' High School, Indore.

Chatterjee, Rev. J. C., Superintendent of Education, Delhi, Ajmer-Merwara and Central India.

Crofton, R. M., I.C.S., Excise and Opium Commissioner in Central India and Adviser on Opium Affairs in Rajputana, Indore.

Davies, P., Consulting Engineer, Holkar State.

Desai Mahadev, Maganwadi, Wardha.

Devisingh, Thakur, Lt.-Col., Rai Bahadur, Singha Member, Jaipur.

Dhanda, Captain H. C., Deputy Commissioner, Commerce and Industry, Holkar State, Indore.

Dodds, J. L. (Mr. and Mrs.), American Presbyterian Mission, Dehra Dun, U. P.

Fatehuddin, Chowdhri, Khan Bahadur, Offg. Director of Agriculture, Punjab, Lahore.

Foster, A. R., Imperial Chemical Industries (India), Ltd., Calcutta.

Gandhi, M. K., Wardha.

Ghosh, Harijiban, M.A., Professor and Head of the Department of English, Holkar College, Indore.

Gulamali, Huzur Secretary to His Highness the Nawab of Jaora, C. I.

Hardy, M. E., D.Sc., Private Secretary to His Highness the Maharaja Holkar.

Hill, M. (Miss), Toronto, Canada.

Hilliard, D. (Miss), Mission Hospital, Indore.

Holkar, Malhar Rao, Sardar, Ada Bazar, Indore.

Holkar, Her Highness the Maharani, Indore.

Hutchinson, E. (Miss), Pemba, Zanzibar.

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Ram Prasad Singh, Rai Sahib, Thakur, Economic Botanist, United Provinces Government, Cawnpore.

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Reshimwale, Gopal Rao, Sardar, Indore.

Roberts, Sir James R., Special Member, Council of State, Dewas (Senior), C. I.

Roberts, Lady, Dewas (Senior), C. I.

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Talcherkar, V. A., late Textile Expert to the Holkar Government, Indore.

Taore, K. A., Dr., Dewas (Senior), C. I.

Taylor, Rev. J. T., United Church of Canada Mission, Indore.

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Thakurdas, Sir Purshotamdas, Kt., C.I.E., M.B.E., Vice-President, Indian Central Cotton Committee, Bombay.

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Zalim Singh, Sardar, Kamavisdar, Dewas (Senior), C. I.

Zutshi, Dewan Bahadur B. N., Vice-President, State Council, Rewa, C. I.

5. *Library.*—Accessions during the year were thus :—

Text-books and works of reference	71
Volumes of Journals	193
Reports, Bulletins, etc.	546
Total accessions ..	810

Six new journals have been added to the list of periodicals taken by the Library. Loans of 182 books and journals were made to cotton research workers and others and to libraries in India and abroad, a routine of circulation being in force. No less than 1,690 books and bulletins have been sold, to the value of nearly Rs. 750. Progress has been made with the classification of the library by the Universal Classification System; the books and pamphlets have been re-arranged on the shelves and a shelf index made for the latter.

Research Work.

6. *Organization.*—There is little new to record under this heading; the extra facilities provided mentioned in the last report have been fully utilised with increased output of work and efficiency. A still larger number of field trials have been handed over to the Farm Section for execution so freeing research staff for other work.

The methods referred to in the 1934 report of central control of field experiments in out-stations have proved themselves and have been expanded; by their aid a very large mass of information of known accuracy has been acquired.

Once again the cordial co-operation of the States' Darbars and their officers, as well as no small number of voluntary workers, must be acknowledged. With this aid much more rapid progress is made possible.

Similar acknowledgment is also due to the Provincial Departments of Agriculture, notably those of Bombay, the United Provinces, the Central Provinces, the Punjab and Madras for much assistance and co-operation willingly rendered, also to Agricultural

Departments in the United States of America, Australia, South Africa and other parts of the Empire and to officers of the Empire Cotton Growing Corporation.

7. *Weather and its effect on crops.*—In Malwa, following a *rabi* season of low rainfall, the 1934 monsoon was exceptionally heavy, a total of no less than 57.37 inches of rain being recorded, the yearly average being about 30 inches. Thus for the fourth successive year *kharif* crops on the black soils and also in East Central India suffered from the deterioration of soil through excess of moisture. Fortunately there were two breaks in the continuity of rainfall which enabled some recovery to be made. In the Nimar tract South of the Vindhyas excellent crops were the rule and Rajputana with its lighter soils on the whole gained by the higher rainfall it experienced, although on the Eastern side late rains also did damage, particularly to cotton and small grain crops.

Severe frosts in mid-January caused much damage in all parts of Central India and Rajputana. The third pickings of cotton were usually destroyed and in some areas even the second ; this has given a set-back to the improved Malvi cotton distribution schemes. Gram suffered badly, sugarcane was damaged, especially for use as seed, and tobacco in the early districts was cut to the ground and abandoned. Severe hailstorms harmed *rabi* crops in East Central India.

8. *Cotton—Botany and Genetics.*

(*a*) *Botanical Survey of cottons in Malwa and Nimar.*

A draft paper on the *botanical classification of cotton* with special reference to Asiatic species has been written and awaits the verification of a few small points at the Herbarium, Royal Botanical Gardens, Kew. This paper deals with botanical principles only.

The analysis of the *survey of Malvi and Nimari cottons* is at present being written up. It is hoped in this paper to indicate the possibilities and limitations of an agricultural classification.

The survey data reveal very interesting and important differences in survival value of different types in Malwa and Nimar, and physiological work is being undertaken to discover the causes of the differences in plant response. The position of Upland types in the Malvi crop also appears to be anomalous, and experiments have been laid out to discover whether it can hold its own against *desi*, and if so, by what means.

Useful information has been obtained and valuable types have been selected from a collection of Burma and Assam types obtained through the good offices of the Hon'ble the Agent to the Governor-General in Central India.

(*b*) *Genetics.*—The study of X-rayed material yielded negative results. Some indications of cytological abnormality were noted but on further investigation they proved to be of small importance. This line of work has been suspended in favour of lines of more immediate value.

Work on the inheritance of major factors continues, and results are expected in the coming crop. Certain lines of study which on investigation proved likely to yield a small return for a large amount of work have been abandoned in favour of more promising subjects. The more important changes involved are the closing down of studies on minor lint colour factors and the exclusion of the study of aberrant mendelian ratios from the short petal experiments.

Work on the *inheritance of quantitative characters* has now become the main part of the genetics programme. The results obtained by the improved technique (see below under statistics) developed in the season under review have been very encouraging indeed

and indicate that modern statistical principles are capable of providing a solution to what has in the past been one of the chief difficulties in the study of quantitative inheritance, namely the control of environmental variation. Work is proceeding in three main lines :

(*i*) The study of genetic variance in relatively uniform material. This has led to the discovery that considerable further improvement is possible in both Malvi 1 and Malvi 9, and also that Malvi 9, which is the better of the two, is also the one which is capable of the greater further improvement. Variation between strains in susceptibility to wilt has been observed in Malvi 9 and has provided an opportunity of studying the inheritance of this character.

(*ii*) The study of genetic variance in crosses between three important agricultural types of G. arboreum (Malvi, Bani and Roseum). It is intended in these crosses to study particularly the relation between characters of commercial importance and those responsible for the morphological differences between the types. Some information is already available concerning the extent to which the lint characters of one type may be combined with the morphological characters of another, and it is hoped to extend and amplify it. This work links up naturally with the study of the survival value of different morphological types, and will have an important practical application in delimiting the breeding potentialities of the commonly cultivated types of G. arboreum, and in serving as a guide to plant breeders faced with the problem of combining the greatest possible vigour with the most desirable lint characters.

(*iii*) The study of genetic variance in interspecific crosses.

Work on this subject was started in 1933, and F_2 and backcrosses will be grown in the coming season. The programme has been enlarged and intensified in response to the need of plant breeders for information on this very obscure subject.

Study of the rate of mutation in mutable strains is proceeding slowly as mutable strains do not grow well in black soil. The occurrence of somatic mutation from brown to white lint (KK to kk) has, however, been demonstrated in heterozygous material.

(*c*) *Cytology.*—Cytological work has demonstrated that in one of the two sterile mutant strains, sterility is not due to cyto-genetic abnormality. The inheritance of sterility in this type remains obscure. The other strain has been shown to carry a simple mendelian recessive factor for sterility. The cytology of the sterility in the mendelian recessive is now being studied.

The study of hybrids between G. africanum (=G. Anomalum) and cultivated Asiatic cottons continues, and second backcross seedlings are now being raised. It appears that the normal chromosome compliment of all plants so far studied is 26, but certain plants contain small " islands " of tetraploid tissue.

(*d*) *Physiology.*—The study of hair characteristics has been slowed down pending receipt of the new tester designed by Dr. Nazir Ahmad, Director of the Technological Laboratory, Matunga, Bombay. The study of tests for lint quality to deal with large numbers of small samples is proceeding. The spinning value of Malvi cottons predicted from fibre tests appears to be almost 50 per cent. higher than the actual value as determined by spinning tests.

(*e*) *Selection and Breeding.*—The amount of seed of Malvi 1 and Malvi 9 available for distribution for 1935 *kharif* was curtailed by the frost which destroyed the crop in the middle of January 1935. The demand for seed has been most encouraging, and far beyond the supply available. Both Malvi 1 and Malvi 9 have been distributed, and owing to the discovery that the two strains probably differ in their response to different soils and regions, both are being retained in the distribution scheme for the present.

A number of new selections from Malwa will be tested in replicated progeny rows this season, and desirable progenies will be carried on and tested against the existing strains.

Selection work on Malwa Upland cotton has been transferred to Badnawar (Dhar State) in the best Upland cotton growing district in Malwa.

At Dhar, progeny row selection has been initiated in a mass selected Malvi cotton maintained by the Agricultural Department, and in the Nimar tract of Dhar State selection in the local Nimari bulk has given an immediate improvement of considerable magnitude.

Thanks to the co-operation of the Agricultural Department, Dhar State, it has been possible to carry out the breeding work in all three of these centres by the replicated progeny row technique developed at the Institute.

Work is being started on the much-needed improvement of Rajputana Bengals. Hybrid material from a cross made in Trinidad has been sent for study in Ganganagar (North Bikaner), and a beginning has been made in the separation of longer linted components from the *desi* mixture of Jodhpur and Jaipur.

(*f*) *Variety Trials.*—A large number of variety trials were carried out in the period under review. The potentialities of existing selected varieties for the different tracts of Central India and Rajputana are now fairly well known, and may be summarised as follows :

(1) Black soil tracts of Central India (Malwa plateau) :

(*a*) Malvi 1 and Malvi 9 yield about 20 per cent more than the local mixture. Malvi 9 gins 32·34 per cent. as against about 28 per cent. in local. Malvi 9 spins about 40 per cent. higher counts than local.

(*b*) Cambodia yields very much less than *desi* on all types of land with the possible exception of areas irrigated from tanks, which are being further investigated. It may be said with confidence that Cambodia will not pay the cultivator in Malwa unless he receives a 50 per cent. premium for his *kapas*. The actual premium paid for Cambodia *kapas*, as ascertained from ginners and the Indore Mills, is not more than 15 per cent.

(2) *Nimar tract.*—Banilla will give the cultivator an immediate increase in return on account of its higher ginning percentage. Verum is lower yielding than the local mixture, but would pay if pooling and marketing facilities were provided.

(3) Gang Canal Colony, well and tank-irrigated sandy lands in Rajputana :

Cawnpore 520 is a definite improvement on Mollisoni in the Gang Canal Colony, and will probably pay better than local on most irrigated sandy lands. Rosea Bhatla has given very high yields in Rajputana, but is very poor in quality. It is rather doubtful whether American types have any permanent place in Rajputana.

(4) *Bundelkhand.*—The extension of cotton in this tract would be of very doubtful value. Yields in all trials carried out for the Institute have been extremely low owing to heavy boll shedding after untimely rains, and Pink bollworm attack. No recommendation can be made.

9. *Cotton—Physiology, Pathology and Agronomy.*—A very large amount of data of varied character has been accumulated and is being reviewed. The following summary deals with only a small fraction of it.

(*a*) *Bio-chemical studies on Wilt.*—Indications from the previous year's work regarding root-relationships were confirmed thus :—

(*i*) In the course of root studies healthy and wilted plants were removed from the soil together with the whole of their root systems. Microscopic examination of this material is being made to trace the course of infection. This work is not finished but it has been amply confirmed that the presence of fungus in a plant does not necessarily lead to its death, or even to any wilting On the other hand wilting followed by death occurred when no fungus could be found.

Further examination of the root systems of pairs of healthy and wilted plants again showed less root activity in diseased plants than in healthy ones. A more detailed examination is being made, some of the results of which are tabulated.

TABLE 1.—*Root activity of healthy and wilted cotton plants in relation to soil zones, 1933-34.*

Average lengths in inches of active roots of Malvi Cotton,

(Based on root exposures of 21 plants).

Soil zones.	Healthy.	Wilted.	P.
0-9″	37.1	15.3	< 0.01
9″-18″	17.4	5.3	< 0.05 > 0.02
18″-downwards.	16.6	8.9	> 0.05

Note.—In this and subsequent tables when P is shown as less than 0.05 the odds in favour of the validity of the result shown are 20 to 1 ; if less than 0-01 the odds are 100 to 1. When P is greater than 0.05 the odds are less than 20 to 1.

It seems that this weakening of root activity is located in the upper soil zones and it is from them that the plant's nutrition is chiefly derived. It appears that this is a concomitant of wilt.

(*ii*) Last year's observations on the periodicity of virulence were further extended and amplified. Periodicity in virulence is now established. This data is being examined in greater detail.

(*iii*) *Soil moisture relations and wilt.*—Total and hygroscopic moistures were determined, at intervals in the field in two zones around the roots of healthy and wilted plants. Results are given in Table 2—A, B, C.

TABLE 2.—*Means percentage moistures in soils around the roots of healthy and wilted cotton plants.*

A. TOTAL MOISTURES.

Depth of soil.	Healthy plants.	Wilted plants.	Total.
3″—6″	27.65	35.14	62.79
9″—12″	29.21	30.30	59.51
Total ..	56.86	65.44	122.3

Healthy < Wilted P < 0.05, Sig. diff. 7.21.

B. HYGROSCOPIC MOISTURE.

Depth of soil.	Healthy plants.	Wilted plants.	Total.
3″—6″	9.7	12.9	22.6
9″—12″	11.6	10.8	22.4
Total ..	21.3	23.7	45.0

Interaction of depth with healthy and wilted plants—

Moisture values $P<0.05$, Sig. diff. 2.72.

C. RATIOS OF MEAN PERCENTAGE MOISTURES FOR TWO DEPTHS AROUND THE ROOTS OF HEALTHY AND WILTED COTTON PLANTS.

Ratio.	Healthy plants.	Wilted plants.	P.	Significant difference.
$\frac{9''—12''}{3''—6''}$	1.05	0.90	<0.05	0.14

The moisture contents around wilted plants were higher than around healthy plants (A). Ratios of moisture contents in the lower zones to those in the higher zones were greater than unity and higher for healthy plants than for wilted plants for which the ratios were less than unity (C).

The hygroscopic moistures of the upper soil zones were higher around wilted plants than healthy ones (B).

The physical condition of soil around healthy plants seems to permit a greater percolation of water to lower depths and conversely the upper zones around wilted plants are charged with larger amounts of water because the soil has become less permeable (as indicated by the higher hygroscopic moisture of those zones). The influence of this on root aeration is clear. The reduced activity actually found in the upper portions of the root systems of wilted plants mentioned above corroborates these observations.

Leaf samples from healthy and wilted plants were collected and are awaiting analysis, to locate the changes in the metabolism of the plants brought about by reduced root activity.

(*iv*) *Nutrition and cotton wilt.*—Another line of investigation started in 1933 was as follows :—

Soils both in pots (1933 and 1934) and in the field (1934) were treated with—

(*i*) inorganic nutrients in different proportions,

(*ii*) manures of widely different compositions and properties and

(*iii*) dressings of substances calculated to effect a physical improvement of the soil.

The soils were inoculated with vigorous cultures of the fungus and sown with Malvi cotton. Repeated inoculations were made to ensure active infection throughout the period of observations. The identical soils in pots of the 1933 experiments were given the same treatments in 1934.

Different degrees of virulence were observed in different treatments in fields and pot cultures. Some of the results are given below.

TABLE 3.—*Effect of nutrients on incidents of Wilt.*

Treatments.	1933-34.	1934-35.	Increase in death % in 1934-35 over 1933-34.
1. N. (NH_4 & NO_3) Ratio ammoniacal N to nitrate N 1 : 1.	50.0	100.0	+ 50.0
2. N + P_2O_5	50.0	91.7	+ 41.7
3. K_2O + P_2O_5 (1 : 1)	25.0	80.0	+ 55.0
4. CaO	16.7	65.2	+ 48.5
5. K_2O + P_2O_5 ($\frac{1}{2}$: 1)	8.3	41.6	+ 33.3
6. K_2O + P_2O_5 (1 : $\frac{1}{2}$)	8.3	33.3	+ 25.0
7. MgO	0.0	49.2	+ 49.2
8. Compost	0.0	29.2	+ 29.2
9. Glue	0.0	19.2	+ 19.2
10. Farm Yard manure	50.0	42.8	— 7.2
11. Control	19.4	12.2	— 7.2
P.	<.05	<.05	
Sig. diff.	27.2	30.8	

Salts used were ammonium nitrate for N, Potassium sulphate for K_2O, Sodium phosphate for P_2O_5.

In the series with added nutrients, the same relative differences were observed successively for two years. Some treatments have increased and others have decreased the virulence. In 1933 the highest virulence was induced by nitrogen alone, and with phosphate; it increased considerably in 1934. Potash with phosphate (1 : 1) in 1933 did not increase virulence significantly but in 1934 this treatment reached the level, in this respect, of the nitrogen alone and with phosphate.

When the ratio of potash and phosphate was altered in either direction the increase of virulence in 1934 did not reach significance, though reduction in potash nearly did so.

Magnesia and lime did not differ from control in 1933 but gave a significant rise in virulence in 1934 of the same order as potash and phosphate ($\frac{1}{2}$: 1).

Compost and glue in both years showed no significant difference from farm yard manure and control, though the first pair showed a numerical rise in virulence in 1934 and the second pair a fall.

An excessive supply of nitrogen seems to be very powerful in increasing susceptibility. A study of the cumulative effect of several treatments is perhaps likely to give further information, as to the nature of the balance between soil components which determines resistance or susceptibility.

(*v*) *The yield of cotton as influenced by wilt incidence.*—In order to discover whether in an infected soil an invisible attack on apparently healthy plants could be traced from a measure of their yield vigour, plant yields of *kapas* were recorded in 1933 and 1934 for apparently healthy plants growing in apparently wilt-infected and uninfected field patches. These were compared with yields of wilted plants, both dead and showing fresh growth. The average yields per plant are tabulated with a statement of significances of their differences in Table 4. These observations were taken from time to time over the harvest period on plants surviving to the bearing stage. The yield is seriously depressed by wilting, whether the plant dies or survives to grow later. The differences between yields of healthy plants from affected and unaffected patches were not significant, but it is yet to be seen whether they would be significant when compared picking by picking.

TABLE No. 4.—*Influence of 'Wilt' on cotton yield.*

KAPAS, GMS. PER PLANT.

Healthy plants.	Mean yield.	Comparison	N.	T.	P.
A. From unaffected patches	17.05	A Vs. B.	47	1.7	>.05
B. From affected patches	12.0	A Vs. C.	45	4.89	<.01
		A Vs. D.	40	4.48	<.01
Wilted plants.		B Vs. C.	54	4.7	<.01
C. Dead	4.3	B Vs. D.	49	4.3	<.01
D. Resumed fresh growth	4.2	C Vs. D.	47	.009	>.05

(*b*) Cotton nutrition in relation to environment:

(Yield)

(*i*) Soil type. The influence of sowing date on yield was reported last year; that of soil type was then investigated in lysimeters filled with field soil, zone by zone, as it exists in nature. The soils used were:

(1) Jaipur sandy soil.

(2) Soil of the Badnawar tank areas in Dhar State (noted for good Cambodia cotton).

(3) Black soil well-drained but shallow (about 2 to 3 feet) from Institute Field 31.

(4) Light grey-coloured, deep soil (about 15 feet), well-drained, from Institute Field 40.

In 1933 Cambodia (Indore 1) and Malvi (No. 9) cotton were sown, no manure was given and after the monsoon rain-water was applied as required; hence the intrinsic differences in productivity and varietal suitability of the soils were the only operating factors. The relative exhaustion of these soils by the cotton crop was measured by growing a second crop of the same varieties in 1934. Again no manure was given nor any water after the cessation of rains which were exceptionally copious.

In this and the next three experiments, which were in the nature of "feelers," the data given in Tables 5 to 9 are not capable of statistical examination.

TABLE 5.—*Calculated yield of seed cotton in gms. per 100 sq. ft. in Lysimeters*—1933 *and* 1934.

Variety.	Soil 1.		Soil 2.		Soil 3.		Soil 4.	
	1933	1934	1933	1934	1933	1934	1933	1934
Indore 1	289	15	1332	113	110	0	237	7
Malvi 9	449	218	1194	250	212	169	431	232

In 1933, soil 4 yielded more than soil 3 but slightly less than soil 1—Soil 2 stands by itself. In general there was a great fall in yield in 1934—much more than was to be expected from seasonal variation. This fall is greater for Cambodia than Malvi which yielded 20 per cent, 46 per cent, 51 per cent and 79 per cent. less in soils 3, 4, 1 and 2 respectively. Soil 2 (Badnawar) comes from the seepage areas of tanks and these soils are heavily manured. The Cambodia crop in Jaipur is also heavily manured and then yields almost as well as at Badnawar. The successful cutlivation of cotton on the same land year after year practised at Badnawar seems to depend, therefore, on the very heavy manuring given—a

custom inherited from the opium crop practice by its present successor. The deterioration of this soil through one crop of cotton is more serious than that of ordinary black cotton soils and it is questionable how for the current practice is sound.

(*ii*) *Humus supply.*—It was reported in 1934 that yields of Malvi increased when manure was applied to the whole profile, in strong contrast with the insignificant yield differences from field crops surface dressed.

Cotton—Cambodia (Indore 1) and Malvi (No. 9) was grown in the same manured profile plots in 1934 to ascertain the continuity of the effect of profile application with the following results :—

TABLE 6.—*Calculated yields of seed cotton in gms. per* 100 *sq. ft. in manured profile plots,* 1933 *and* 1934.

Treatment.	Malvi 9.		Indore 1 1934.
	1933.	1934.	
No treatment	1170	656	165
Farm Compost	2167	1396	749
Farm Yard Manure	1886	916	615
Municipal Compost	2376	1192	547

In 1933 manures were mixed throughout the profile down to murum—18-24 inches in depth. In 1934 they were given as surface dressings at 10 tons per acre.

Because of a difference in plant spacings the yields for the two years should not be compared together but the order of productive capacity of treatment may be contrasted.

The 1934 manured yields are so much higher than the control that the effect of profile manuring in 1933 can be assumed to have been continued. It is noteworthy that farm compost and municipal compost (with its higher phosphate content) have changed places in 1934 and the superiority of Malvi over Cambodia on black cotton soils both manured and unmanured is clearly indicated.

(*iii*) *Soil texture.*—The influence of open surface texture reported last year was tested for residual effect, a cotton crop being sown again on the same plots with the following results :—

TABLE 7.—*Soil texture and cotton yield*—1933 *and* 1934. *Calculated yields of seed cotton in gms. per* 100 *sq. ft.*

Variety.	Unmanured.			Manured.		
	Control.	Heated soil.		Control.	Heated soil.	
		6″ surface layer.	50% in 6″ surface layer.		6″ surface layer.	50% in 6″ surface layer.
Year 1933.						
Indore 1 ..	221	456	608	277	762	955
Malvi 9 ..	658	1164	801	910	1399	1174
Year 1934.						
Indore 1 ..	163	26	123	143	115	68
Malvi 9 ..	215	375	347	232	222	144

In 1933, in unmanured plots, the 50 per cent. heated soil treatment gave the highest yield with Cambodia, and the full 6 inches layer treatment with Malvi. The response to manures for Cambodia was considerably higher in the plots treated with heated soil than in the control. Malvi responded to manure better than Cambodia on untreated plots but when the plots were treated with heated soil the percentage increase of Malvi due to manure was less than that of Cambodia, and also less than its percentage increase in response to manure on untreated soils. But the absolute yields are still highest for the treated plots, the full 6-inch layer (with manure) being the best. This seems to indicate that the very open texture induced by the 6-inch layer of heated soil influences Malvi yields in the same way and to a greater extent than does manuring. With Cambodia, however, open texture was an essential factor for any increase in yield with or without manures.

All yields fell in 1934, but the fall was least with Cambodia in the untreated plot without manure. The greatest exhaustion took place in manured plots except for one plot with a 6-inch layer treatment. The degree of exhaustion is not strictly parallel to the yields of 1933 probably because of the varying degree of subsequent recuperation. Manure has partially compensated for the exhaustion of the full 6 in. layer plot. The net yields are, however, highest in controls in 1934. Malvi also shows a similar exhaustion—more than Cambodia in the control plot—and the differences due to heated soil treatment or manuring are slight. Malvi shows a better response to heated soil treatment without manures than does Cambodia. The greater responses in 1933 of Cambodia to 50 per cent. heated soil and of Malvi to the full dressing probably indicate the reaction of their root-systems to the balance maintained between moisture and aeration due to the treatments in their active zones. The favourable influence of the manured profiles is however the same for both varieties, showing clearly the superiority of humus in raising yields. It is also evident that about six inches depth of soil of open texture brings a higher response to manures.

(iv) Nutrients.—In spite of negative results from field trials in 1931 and 1932, the results set out above clearly indicated the possibility of a favourable response to manures under certain soil conditions. A qualitative test was made in 1933 in pot-cultures to find what nutrients were most likely to induce response. The 92 pots were filled with uniformly graded surface soil treated in bulk with their respective nutrients. The experiment was done in duplicate with Cambodia (Indore 1) and Malvi 9 cotton.

In 1934 another experiment was made with four replications using 192 pots, to test the effect of the more promising nutrients upon soils treated to bring about differences of texture by flocculation.

The results are shown in Table 8, A to F.

TABLE 8.—*Differences in response of Cambodia, Indore* 1 *and Malvi* 9 *to nutrients.*

A.—MAXIMUM RESPONSE—1933 EXPT.

Influence on	Indore 1.			Malvi 9.		
	Treatment.	Control.	Wts. or hts. max.	Treatment.	Control.	Wts. or hts. max.
Yield of *kapas* ..	am. sulph. in 2 doses	1.2	21.2	am. sulph. + di-sod. hyd. phosph.	2.6	19.3
Plant weight after 43 days.	am. sulph. + di-sod. hyd. phosph. + pot. sulph. 1 dose.	2.7	13.0	am. sulph. + di-sod. hyd. phosph + pot. sulph. 1 dose.	1.8	7.2
Final height after 133 days.	am. sulph. in 2 doses.	9.75	19.5	am. sulph. + di-sod. hyd. phosph. in 1 dose.	11.0	44.25

B.—Depressing influences of treatments.

Depression in	Treatments.	
	Indore 1.	Malvi 9.
Yield of *kapas* ..	Nil.	am. sulph. 1 dose.
Plant weight at 43 days.	am. sulph. + pot. sulph. 2 doses, Pot. sulph. 1 dose and 2 doses, sod. nitrate 2 doses.	Sod. nitrate 1 dose, pot. sulph. 2 doses, di-sod. hyd. phosph. 1 dose, am. sulph. 2 doses.
Final height	Di-sod. hyd. phosph. 1 dose and 2 doses, pot. sulph. 2 doses.	Pot. sulph. 1 dose.

C.—Modifying influence of components other than the nutrient elements.

	Yield.		Plant weight.		Final height.	
	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.
Nitrogen alone.						
am. sulph. 1 dose	9.1	1.7	6.0	1.4	13.75	23.0
sod. nitrate 1 dose	8.3	4.6	5.7	1.6	14.5	21.5
calc. nitrate 1 dose	8.7	11.85	3.9	2.4	14.5	34.0
Phosphates alone.						
di-sod. hyd. phosph. 1 dose ..	5.3	6.45	3.8	1.2	8.5	13.5
super-phosph. 1 dose	7.8	8.0	2.9	2.1	13.5	18.0
am. sulph. + di-sod. hyd. phosph. 1 dose	7.2	19.3	7.0	5.4	11.5	44.25
Nitrogen plus phosphate.						
am. sulph. + di-sod. hyd. phosph. 1 dose	7.2	19.3	7.0	5.4	11.5	44.25
Nicifos 17/45	12.5	16.25	3.3	3.4	15.25	29.0
Nicifos 22/18	11.9	11.20	10.1	2.2	12.5	18.0

D.—Influence of one nutrient element on another.

	Yield.		Plant weight.		Final height.	
	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.
am. sulph. + di-sod. hyd. phosph. 1 dose	7.2	19.3	7.0	5.4	11.5	44.25
am. sulph. + pot. sulph. 1 dose.	4.90	4.0	6.6	3.1	13.0	18.5
am. sulph. + pot. sulph. + di-sod. hyd. phosph. 1 dose ..	14.1	3.9	13.0	7.2	14.5	30.0

E.—COMPLETE NUTRIENT IN DIFFERENT FORMS AND WITH DIFFERENT RATIOS NK : P_2O_5.

	Ratio.	Yield.		Plant weight.		Final height.	
	N: K_2O: P_2O_5.	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.
Safflower cake	1:0.33:0.66	17.0	..	6.4	3.5	14.0	..
Municipal compost ..	1: 1.4 : 1.7	11.0	14.6	5.4	3.5	11.0	22.25
Farm compost	1: 3.4 : 0.58	6.5	6.10	6.4	2.1	10.0	18.0
Farm yard manure ..	1 : 3.9 : 1.7	5.6	7.3	4.2	2.9	14.5	16.0

F.—MODE OF APPLICATION, ONE AND TWO DOSES.

		Yield.		Plant weight.		Final height.	
		Indore 1.	Malvi 9.	Indore 1.	Malvi 9.	Indore 1.	Malvi 9.
am. sulph.	1 dose ..	9.1	1.7	6.0	1.4	13.75	23.0
	2 doses ..	21.2	14.4	3.6	1.7	19.5	25.0
sod. nitrate	1 dose ..	8.3	4.6	5.7	1.6	14.5	21.5
	2 doses ..	11.4	7.2	2.1	2.6	13.0	16.75
di-sod. hyd. phosph.	1 dose ..	5.3	6.45	3.8	1.2	8.5	13.5
	2 doses ..	4.20	3.0	2.8	3.8	9.0	11.5
am. sulph. + di-sod. h y d. phosph.	1 dose ..	7.2	19.3	7.0	5.4	11.5	44.25
	2 doses ..	7.7	7.7	10.3	2.2	15.5	25.5
pot. sulph.	1 dose ..	4.97	4.40	2.1	2.6	14.0	10.5
	2 doses ..	6.0	5.5	8.25	1.2	8.25	13.0
am. sulph. + pot. sulph. + di-sod. hyd. phosph.	1 dose ..	14.1	3.9	13.0	7.2	14.5	30.0
	2 doses ..	6.6	13.75	6.5	6.0	15.25	31.75
am. sulph. + pot. sulph.	1 dose ..	4.90	4.0	6.6	3.1	13.0	18.5
	2 doses ..	3.15	6.10	2.4	3.9	12.5	16.0

The following points were brought out by these pot-cultures:—

(1) The greatest plant weights for both varieties within a period of 43 days from germination were produced by complete nutrients given in one dose.

(2) Maximum *kapas* yields of Cambodia however were given with ammonium sulphate in two doses and of Malvi 9 with a mixture of ammonium sulphate and di-sodium-hydrogen-phosphate in one dose.

(3) Maximum heights were given by those treatments which gave maximum yields.

(4) The yield of Cambodia was increased by all treatments. Ammonium sulphate in one dose, however, depressed it for Malvi 9.

(5) Plant weights at 43 days and final heights were lower than control with some treatments.

(6) Nutrients applied in different combinations gave different results, the varieties not always responding in the same way. Practically equal responses were obtained from treatments differing in the preponderant nutrient elements. Single nutrients sometimes gave the same result as that from a combination.

Absolute values (plant-weight) for the early start or the final growth (height) do not show any consistent relation to the total yield. The effect of nitrogen is influenced by the presence or absence of other elements (potash and phosphorus). The combination of nitrogen and phosphorus had a beneficial effect on Malvi 9 and to a certain extent on Cambodia. Different ratios between elements supplied in the same form have different effects but such different effects can also be produced by nutrients in the same ratio but in different forms.

For both the varieties the application of nitrogen and in some degree potash in two doses is better than in one dose but two applications of phosphorus have the reverse effect. Combinations of nitrogen and potash, and nitrogen, phosphate and potash gave better results with Cambodia when applied in a single dose, but with Malvi 9 it was the reverse. Nitrogen and phosphorus are better in one dose combined on Malvi 9 but on Indore 1 there is no difference between one and two doses.

An effective system of manuring will have to be based upon the correct intensity of nutrient supply, especially of nitrogen, and to a less extent phosphorus, in the early and later stages of growth.

The effect of the unabsorbed residues of the chemicals used (bases, acids, etc.) is known to be indirect through their modifying influence on the physical condition of soil, hence it seemed necessary to determine the soil texture suitable for the utilisation of the nutrients.

The results of the 1934 experiment which was intended to give further information in this direction are tabulated below.

TABLE 9.—*Texture differences and nutrient efficiencies for cotton*, 1934-35.

Yield of seed cotton and plant weights are given in gms. per plant and heights in inches.

A.—INDORE 1.

Treatment.	No Treatment.			Compost.			Acid.			Compost + Acid.		
	Yield Kapas.	Final plant weight.	Final plant height.	Yield Kapas.	Final plant weight.	Final plant height.	Yield Kapas.	Final plant weight.	Final plant height.	Yield Kapas.	Final plant weight.	Final plant height.
Nil	3.5	9.0	7.6	4.9	14.8	14.9	2.8	5.6	3.9	8.7	25.4	14.7
N	4.8	7.0	7.8	14.0	40.3	22.5	4.6	14.0	10.0	8.9	27.1	16.6
P	10.7	68.0	12.3	6.8	21.0	15.3	2.5	7.0	6.4	4.9	8.8	10.4
K	7.7	15.0	14.8	19.2	75.2	20.3	6.3	9.0	9.9	6.6	10.5	13.9
NP	15.6	41.9	29.2	18.7	93.6	26.4	7.0	13.1	14.1	7.6	15.7	14.2
NK	8.6	19.8	20.4	13.7	86.0	24.7	0.6	4.4	14.2	11.7	33.8	20.4

B.—MALVI 9.

Nil	2.8	5.2	13.9	6.3	13.1	32.4	1.3	1.7	16.1	5.9	26.2	33.5
N	3.2	28.8	11.0	13.9	15.1	56.7	4.0	10.0	20.7	12.1	32.3	38.7
P	2.7	15.7	21.2	6.3	25.2	36.5	1.3	4.0	12.5	3.8	8.7	24.5
K	2.3	4.2	15.0	9.9	25.3	31.2	5.4	20.1	10.9	5.6	24.5	31.1
NP	15.2	77.8	52.2	12.7	57.7	59.8	7.2	18.3	29.9	8.7	19.2	38.4
NK	3.9	23.6	38.8	13.4	64.0	50.7	3.2	7.0	17.0	6.8	61.2	49.4

SIGNIFICANCES.

Treatments.

	P.
Texture	< 0.01
N & No N	< 0.01
K & P	< 0.01

Interactions.

(N & No N) × (K & P)	< 0.01
Texture × (N & No N)	< 0.05
Texture × (K & P)	< 0.01
Texture × (N & No N) × (K & P)	< 0.01
Varieties × Texture	< 0.05
Varieties × (K & P)	< 0.05
*Varieties × Texture × (N & No N) × (K & P)	< 0.01

* Sig. diff.=2.4 for mean yield of *kapas* per plant.

The clues given by the qualitative experiment of 1933 were amply confirmed. Cambodia showed a capacity to yield higher than Malvi 9. The highest yields of Cambodia were obtained in the presence of compost, supplemented either by potash alone or a mixture of nitrogen and potash; while Malvi 9 yielded its highest with nitrogen and phosphate in the absence of compost.

Several other points bearing upon cotton nutrition have been brought into relief.

Cambodia Cotton.

(*i*) *Behaviour with nitrogen.* On ordinary black soil this nutrient has no appreciable effect and acid flocculation or combination with potash makes no difference but when combined with phosphate or with compost the yield is raised nearly three times. The addition of compost to the combination of nitrogen and potash gives a similar increase and addition of compost to nitrogen and phosphate leads to a still higher increase in yield. This favourable effect of compost on nitrogen alone and with phosphate and potash is reduced by acid flocculation. There is no difference between the single effect of compost and of nitrogen but acid flocculation with compost treatment nearly doubles the yield in contrast with its effect on nitrogen. In the absence of compost, flocculation of soil reduces the yield by nearly one-third.

It is obvious that compost plays two roles (1) its physical influence on the soil, (2) its supply of nitrogen, phosphate and potash or their combinations according to requirements; a sort of balancing agent, preventing excess or deficiency of any one nutrient.

(*ii*) *Behaviour with potash and phosphate.*—The response to potash is higher than to nitrogen but lower than to phosphate. The addition of compost, however, to phosphate reduces the yield by one-third, but when added to potash yield is increased by nearly two and half times.

(*iii*) Flocculation by acid does not influence the response to potash in the absence of compost but prevents any benefit being derived from it. This is comparable to the similar effect of acid flocculation on compost-treated soils mentioned above, preventing them from deriving any benefit from added nutrients, presumably because of the nature of the flocculation induced by acid contrasted with humic flocculation. This may be taken as an indication that the Cambodia crop with an adequate supply of nutrients demands a moisture supply free from the greater fluctuations resulting from acid flocculation.

MALVI (No. 9) COTTON.

(*i*) Nitrogen has no influence on yield and flocculation by acid or the addition of potash makes little difference, but in combination with phosphate the yields almost become five-fold and reach the maximum for the variety. Compost gives nearly twice as much yield as nitrogen but a combination of compost with nitrogen raises the yield to four times that from nitrogen alone.

(*ii*) Like nitrogen, potash and phosphate alone had no influence on yield.

(*iii*) Flocculation by acids has no influence except in the presence of nitrogen and phosphate together or potash alone. Compost however reduces the response to nitrogen plus phosphate by 20 per cent. and with acid flocculation the yield is further reduced by 25 per cent. to the level of yields from acid alone. In combination with nitrogen acid flocculation raises the yield one-and-a-half times but further addition of compost to the combination gives further increase to three times.

This probably indicates that any favourable influence of compost on Malvi 9 is through its power to supply nutrient and not so much to its effect upon moisture relation.

It appears that the conditions produced by compost in presence of all added nutrients are favourable for Cambodia but definitely unfavourable for Mavi, when the added nutrient is a combination of nitrogen and phosphate.

If the drying effect of compost alone on the soil is assumed to be less powerful on the soil than that of acid flocculation, it may be concluded that compost keeps the moisture at adequate levels except when, as with Malvi 9 treated with nitrogen and phosphate, the demand becomes too high.

TABLE 10.—*Influence of green manure on the yields of wheat and cotton at Indore.*

Variety—Malvi 1.

Yield in lbs. per acre.

Yield of	Green manures cut and removed				Green manures ploughed in						Significant difference.
	Black gram.	Sann.	Soya-beans.	Cow-peas.	Black gram.	Sann.	Soya-beans.	Cow-peas.	Fal-low.	P.	
Total yield :—											
Wheat, 1932 ..	635	577	472	597	604	558	554	479	475	< 0.05	104
Cotton, 1933 ..	540	522	517	547	588	528	566	486	442	> 0.05	——
Yield of two pick-ings of cotton (1st & 2nd) ..	281	267	243	263	291	254	254	245	172	< 0.05	54

V.—HUMUS SUPPLY (FIELD SCALE).

Some of the investigations described in paras (*i*) to (*iv*) above have also been studied under field conditions—the results are summarised below under the same headings. Green manuring followed by wheat in the same year and subsequently by cotton gave higher total yields with wheat but not significantly with cotton, though the first two pickings yielded better with green manure. The rainfall was very heavy (51.82 inches) and it is possible that in normal years increases may also be obtained with total yields (Table 10).

VI.—Soil Texture.

Both Malvi 9 and Cambodia Indore 1 did not respond significantly to field applications of heated soil at five or twenty cartloads per acre. The doses were much smaller than those used for the small plots mentioned above. A test is being made to find the effect of heavier applications within the range of practicability.

Similarly, in another field test flocculation by sulphuric acid gave no yield differences even when repeated twice during the crop period. Superphosphate behaved similarly.

The steady maintenance of favourable moisture conditions resulting from open texture cannot be brought about in Indore soils by mechanical means to ensure good drainage conditions. An experiment repeated for three years consistently gave no significant differences in yields when attempts were made to keep open texture by providing shallow furrows at different intervals between rows of the growing crop to regulate drainage and soil aeration.

In the last three years very heavy rains spoiled several field experiments aimed at estimating the influence on the yields of cotton and other crops of:—

(1) Previous crop.

(2) Interculture to keep mulches of different depths.

(3) Weeding.

(4) Intersowing of other crops.

The last year's experiment shows a significant detrimental influence due to absence of weeding even when the rains have depressed the yields of the cotton crop to the lowest limit.

Table 11.—*Response of common crops to interculture and weeding*, 1932-34.

Yields in lbs. per acre.

A. Crop—Cotton.

Year.	Hand weeding only.	Indore ridger and weeding.	Daura & weeding.	Guntaka & weeding.	P.	Significant difference.
1932	265	270	225	248	> 0.05	—
1934	229	282	312	254	> 0.05	—

B. Crop—Jowar (*Sorghum*).

1932.						
Grain	149	148	251	216	<0.05	48
Kadbi *	4,340	4,300	4,280	3,900	<0.05	497
1934.						
Grain	373	352	409	368	>0.05	—
Kadbi	1,897	2,068	2,166	1,971	>0.05	—

* Dry stems and leaves.

C. CROP—TUR (*Cajanus indicus—pigeon pea*).

Year.	Hand weeding only.	Indore rigder and weeding.	Daura and weeding.	Guntaka and weeding.	P.	Significant difference.
1933.						
Grain	685	615	660	670	>0.05	—
Bhusa*	530	483	553	560	>0.05	—

* Straw and chaff.

D. CROP—COWPEAS.

1933.						
Grain	135	116	146	130	>0.05	—

E. CROP—WHEAT.

1933.						
Grain	330	343	251	228	>0.05	—
Bhusa	492	555	464	451	>0.05	—

F.—INFLUENCE OF INTERCULTURE AND WEEDING ON COTTON (1933) VARIETY—MALVI BULK—LB. PER ACRE.

Ridger and weeding.	Ridger no weeding.	Daura and weeding.	Daura no weeding.	Weeding alone.	No weeding.	P.	Sig. diff.
105.2	10.4	86.4	2.1	60.1	3.1	<0.05	50.4

Shallow interculture either by Daura or Guntaka benefitted the jowar crop in 1933. This seems to be due more to the effective weeding done by these implements than to their capacity to produce a mulch. This has been confirmed by the results of another experiment in 1933.

TABLE 12.—*Yield and growth of jowar as influenced by weeding and interculture.*

Yields in lb. per acre.

1933

VARIETY—JOWAR MALVI.

	Ridger.		Daura.		No interculture.			
	Weeding.	No weeding.	Weeding.	No weeding.	Weeding.	No weeding.	P.	Sig. diff.
Grain ..	181	161	137	100	198	59	<0.05	43.7
Kadbi ..	1,934	1,559	2,259	2,125	2,334	1,950	<0.05	407.8

The extreme importance of weeding is clear. The favourable influence of implements wherever it exists was solely due to their efficiency as weeders. A deeper mulch (" Indore ridger ") without weeding shows a detrimental effect presumably due to competition for moisture between the crop and the weeds not removed by the implement.

The influence of cultivation during the cold weather on the crops of the following season has been studied since 1932. The types of cultivation compared were :—

(1) Opening the soil surface to about three inches, *desi* plough,

(2) Subsoiling,

(3) Soil inversion—Ransome's CT 2 plough, and

(4) Subsoiling followed by opening the soil surface with the *desi* plough.

The experiment has not yet run sufficiently long to show cumulative effects. Heavy rains in the last two years have depressed the cotton crop.

TABLE 13.—*Yield response of common crops to winter cultivation.*

Yield—in lb. per acre.

A. CROP—COTTON.

Year.	No cold weather cultivation.	Country plough.	Subsoiler.	Inversion plough.	Subsoiler & country plough.	P.	Sig. diff.
1932.. ..	160	108	138	140	148	>0.05	—
1934.. ..	51	47	72	49	49	>0.05	—

B. CROP—JOWAR.

1932 Chari* ..	17,430	17,310	16,310	17,110	19,450	>0.05	—
1934. Grain ..	319	204	335	218	263	>0.05	—

* The whole crop cut green.

C. CROP—GROUNDNUT.

1933. Nuts ..	418	354	423	330	351	>0.05	—
Bhusa ..	700	655	722	563	608	>0.05	—

D. CROP—COWPEAS.

1933. Grain ..	95	79	106	80	83	>0.05	—

E. CROP—WHEAT.

Year.	No cold weather cultivation.	Country plough.	Sub-soiler.	Inversion plough.	Sub-soiler and country plough.	P.	Sig. diff.
1933.							
Grain ..	646	554	692	956	22	>0.05	—
Bhusa ..	1,548	1,573	1,614	1,878	1,563	>0.05	—

So far as the results go, however, there seems to be no immediate effect of any type of inter-cultivation on the succeeding crop.

VII. NUTRIENTS (field scale).

At Indore a complex experiment with six factors was carried out on Malvi 9 cotton in a rich field. The general cotton yields of 1934 were very low and the results obtained are naturally indicative of what may be expected in similar seasons. The following comparisons with their interactions were included :—

(1) different depths of interculture (*daura* or " Indore ridger"),

(2) row spacings (14 and 21 inches),

(3) artificial manure,

(4) organic and inorganic manure (Safflower cake and Nicifos 22/18),

(5) Units of nitrogen (7½ and 15 lb. per acre) and

(6) method of application (broadcast and drilled).

TABLE 14.—*Response of Malvi 9 to manures*—1934.

Yield—lb. per acre.

With manures.	Without manures.	P.	Sig. diff.
448	363	<0.05	40.1

Significant differences in yields were obtained only by manuring. Unless it is found otherwise in seasons of different type, a great latitude seems to be available for choosing the method of interculture and the kind of manure (the differences between which were not significant). The present seed rate of twenty lb. per acre could perhaps be reduced to thirteen with saving of labour and time required for sowing. The labour of application of manures can be reduced by drilling them in and an increase of about 23 per cent in yield was obtained at a cost per acre of Rs. 3-2-0 with Nicifos 22/18 (at Rs. 8-6-0 per cwt.) and Rs. 4-3-0 with safflower cake containing 2.6 per cent N. (at Rs. 33 per ton).

At Dhar, however, yields of Malvi cotton were depressed by safflower cake while the higher yields obtained from Nicifos (22/18) though high enough to be significant to cake were not quite significantly different from control. This experiment was located on shallow eroded soil on the lower slope of a hill and hence liable to severe run-off. Under such condition the utility of manure is not likely to be great.

With Cambodia (bulk seed) there was an opposite result; safflower cake gave significantly higher yields than both control and Nicifos (22/18).

TABLE 15.—*Yield differences due to manures.*

DHAR 1934.

lb. *kapas* per acre.

Variety.	Treatments.			P.	Sig. diff.
	Control.	Nicifos 22/18.	Safflower cake.		
Malvi bulk	630	692	541	<0.05	89.9
Cambodia bulk	403	391	474	<0.05	43.8

A similar experiment at Jaipur with Cambodia Indore 1, in addition to confirming the superiority of earlier sowings recorded in 1934 showed yield depression with Nicifos (22/18) while, as at Dhar, the higher yields of the cake treatment did not reach significance.

TABLE 16.—*Sowing dates and yield of cotton.*

JAIPUR 1934.

Variety Cambodia Indore 1.	April.	May.	Rains.	P.	Sig. diff.
Yield in lb. *kapas* per acre ..	982	681	309	<0.05	188

TABLE 17.—*Manure and yield of cotton.*

JAIPUR 1934.

Variety Cambodia Indore 1.	Control.	Castor cake.	Nicifos 17/45.	P.	Sig. diff.
Yield in lb. *kapas* per acre ..	651	831	497	<0.05	266

The high significant difference may be due to inclusion of pre-rain sown plots.

It will be seen that the response of Cambodia is similar to that observed in pot cultures, *i.e.*, continued supply of nitrogen favours Cambodia, while Malvi cotton responds better to a single dose of nitrogen together with phosphate; the response to nutrients depends upon the soil texture and associated moisture capacities.

In nitrification tests at Indore, already reported in a paper*, it has been shown that nitrification of the same manure continues longer in Malwa soil than in Jaipur soil. The better response of Cambodia cotton to cake at Dhar than at Jaipur confirms this in the field.

It is quite clear from the foregoing field results that for the present concentration is likely to be profitable only on the investigations in cotton nutrition and manuring.

Rotation for cotton.—The experiment was started in 1932 and subsequently recast in 1933. It comprises five alternative rotations of cotton with jowar, tur, groundnut, cowpeas and wheat. Started at two points, the full cycle will be complete in 1936 and will then be reported. The separate experiment—the influence on cotton of seven different preceding crops—has been completed but results are not yet examined. The cotton plots of 1934 yielded very low.

(*c.*) *Cotton nutrition in relation to environment—Quality.*—The data from pot cultures of 1934 are not yet statistically examined; they deal with the influence of soil texture, humus supply and nutrients upon the lint length and ginning percentage of Cambodia and Malvi cottons.

Similar data, however, from field experiments at Dhar and Jaipur are discussed below:

Cambodia.—The influence of *environment* on *staple length* was determined on the seed cotton obtained from each treatment in the Jaipur experiment with the following results (Table 18) A to D.

TABLE 18.

Influence of environment on staple length—Jaipur, 1934.

Variety—Cambodia Indore 1.

A

Mean staple length in mm.

Sowing dates.	Manure.				No manure.	
	Castor cake.		Nicifos 17/45.		Plant spacing.	
	Plant spacings.				12 in.	18 in.
	12 in.	18 in.	12 in.	18 in.		
April	25.6	21.8	24.8	24.2	22.3	22.6
May	24.8	24.8	24.5	23.0	23.5	23.0
On rains	23.6	22.7	26.3	24.7	24.9	25.5

* "Nitrogen balance in Black soils" III, Wad. Y. D. and Aurangabadkar R. K. Report, Proc. Ind. Sci. Cong. 935 (in publication).

Rates of manures applied : 21 lb. of N. per acre, *i.e.*, 6 cwt. of castor cake (N=3%) or 150 lb. of Nicifos 17/45 per acre.

Significances.

Treatment.	P.	Sig. diff. for the mean.
Sowing dates	<0.01	
Manure v. no manure	<0.05	
Spacings	<0.05	
B — Sowing dates × (manure v. no manure) ..	<0.01	0.35
C — Sowing dates × (cake v. Nicifos 17/45) ..	<0.01	1.50
D — (Manure v. no manure) × Spacing ..	<0.05	1.20

B

Mean staple length in mm.

Sowing dates × (manured v. unmanured).

Manured.			Unmanured.		
April.	May.	Rains.	April.	May.	Rains.
24.1	24.3	24.3	22.5	23.2	25.2

C

Sowing dates × quality of manure.

Castor cake.			Nicifos 17/45.		
April.	May.	Rains.	April.	May.	Rains.
23.7	24.8	23.2	24.5	23.8	25.5

D

(Manured v. unmanured) × plant spacings.

Manured.		Unmanured.	
Plant spacings.		Plant spacings.	
12 inches.	18 inches.	12 inches.	18 inches.
24.9	23.5	23.6	23.7

The use of manure has maintained a steadier and higher level at almost all sowing dates, closer spacing nearly always giving a longer staple. Without manure, staple length diminished with each earlier sowing, equally for both spacings. Rain-sown crops with Nicifos or no manure gave higher lengths. The kind of manure had different effects at different sowing dates.

Castor cake gave a longer staple on the May-sown crop than that sown on rains but Nicifos raised the staple length of rain-sown cotton to the highest level in the trial.

Considering the following points :—

(1) the rates of nitrification of inorganic and organic manures,

(2) the differences in moisture in hot weather and monsoon,

(3) the higher rate of nitrification in hot weather, and

(4) the differences in evaporation of soil moisture due to spacing during the boll-developing stage, *i.e.*, after the rains cease, it appears that an ample supply of nitrogen with sufficient moisture in the early stages has a favourable influence on staple length.

The results obtained on staple length of the Cambodia crop in the Dhar experiment are given below.

TABLE 19.

Influence of environment on staple length—Dhar, 1934.

Variety—Cambodia.

Staple length in mm.

Plant spacing.	Single unit of manure.*	Double unit of manure.†	No manure.	Mean for spacing.
12 inches	19.1	20.9	19.3	19.8
18 ,, ...	18.8	18.5	18.7	18.7

Significance.

Plant spacings—P <0.05, sig. diff. = 1.0 mm.

Plant spacings × (Cake v. Nicifos 22/18).

Experimental Z = 0.7187, Z required = 0.7205 for P = 0.05.

The crop was poor, due to the effect of heavy rain on soil already exhausted by two sugarcane ratoons, both Leaf-roll and Red-leaf were severe and the lint was weak. The differences due to treatments were therefore generally masked by this severe depression. In spite of this, close spacing again gave longer staple and there is an indication that at close spacing, a higher rate of manuring is likely to lengthen the staple.

This also confirms the suggestion of the favourable effect of initial nitrogen supply and of soil moisture during boll-development.

* Single unit : 7½ lb. N per acre, *i.e.*, 290 lb. of safflower cake (N=2.6%) or 42 lb. Nicifos 22/18 per acre.

† Double unit : double the above quantities.

The results were much more definite in the Dhar experiment with the hardier Malvi cotton. They are tabulated below :—

TABLE 20.

A. *Mean staple length in mm.*

Plant spacings.	Manure.				No manure.
	Safflower cake.		Nicifos 22/18.		
	Single unit.*	Double unit.†	Single unit.	Double unit.	
12 inches ..	19.3	19.2	17.1	18.5	18.6
18 ,, ..	19.2	19.3	16.2	19.0	16.2

Significances.	P.
Manure v. no manure	<0.01
Quality of manure	<0.01
Units of manure	<0.05
Quality × units of manure	<0.05
Spacings	<0.01
B. Spacings × units of manure	<0.01

Sig. diff. = 0.89

C. Spacings × quality × units of manure .. <0.01

Sig. diff. = 1.2 mm.

B.

Mean staple length in mm. per plot.

Plant spacings × units of manure.

Plant spacing 12 inches.			Plant spacing 18 inches.		
No manure.	Single unit.	Double unit.	No manure.	Single unit.	Double unit.
18.58	18.20	18.82	16.18	17.66	19.12

* Single unit : 7½ lb. N per acre, *i.e.*, 290 lb. of safflower cake (N=2.6%) or 42 lb. Nicifos 22/18 per acre.
† Double unit : double the above quantities.

C.

Plant spacings × quality of manure × units of manure.

Plant spacings.	Safflower cake.		Nicifos 22/18.	
	Single unit.	Double unit.	Single unit.	Double unit.
12 inches	19.32	19.16	17.08	18.48
18 ,, ...	19.16	19.28	16.16	18.96

When closely spaced and without manure the crop gave a staple equal to some of those given by manures but the widely spaced crop (without manure) gave the lowest lint length. Nicifos in one unit at the same wide spacing made no difference, but raised it appreciably when the spacing was reduced. Cake at both rates and both spacings gave high staple lengths, higher than a single unit of Nicifos at both spacings and no manure at wider spacing. The double rate of Nicifos behaved in a similar manner. Unlike its effect on the Cambodia crop at Jaipur, cake has given good results with both spacings, while the effect of Nicifos increases with rate and not with spacing. It is difficult to say whether this is due to the use of Safflower cake, instead of castor as at Jaipur or to the differences in variety and environment.

(*d*) *Cotton nutrition in relation to environment—the development of the plant.*—Field experiments carried out in 1933 at Indore and several other places in Malwa and Rajputana showed the possibility of obtaining yields from rain-sown cotton equal to those from summer sowings. Thus it appeared that though the greater intensity of photo-synthesis in a crop started in bright summer might be partly responsible for the high yields obtained, a crop receiving less light in the cloudy monsoon could also exhibit a similar performance under certain conditions. It was considered that a clear understanding of the interactions between photo-synthetic activity and other environmental factors might supply definite 'pointers' for work on cotton improvement suited to different local conditions.

Three varieties, Malvi 9, Cambodia Indore 1, and Punjab-American cotton (P. 289F), were grown in the open in pots (*i*) in sand manured with safflower cake and complete inorganic nutrients and (*ii*) in black cotton soils manured with compost on an equivalent nitrogen basis.

One set was sown at the end of May and another in the beginning of July. Half the number of plants in each set was exposed after daylight to continuous illumination with one 200-watt Crompton gas-filled pearl lamp per plot up to the maturing stage (end of November 1934).

Illumination for about a month produced symptoms of nutrient starvation in the plants and hence two applications of complete nutrients were given to all pots at monthly intervals. During dry weather, the pots were watered according to their observed requirements.

Total figures for all observations taken during and after the period of illumination are given in Table 21, A to C.

The records of bud-production, shedding, total yield and vegetative growth for all the varieties are discussed below :—

TOTAL BUD PRODUCTION.

Malvi.—Maximum bud production was obtained with illumination for both sowings in soil and with or without it for May-sowns and cultures with other treatments, bud-production was nearly 50 per cent. less.

Cambodia.—Illumination doubled the production for July soil plants but did not much affect the production (high or low) of the other treatments.

P. A. 289F.—The total number of buds was low in general and illumination seemed to be unfavourable especially for the July soil culture.

It appears that a favourable effect equivalent to that of increased photo-synthetic activity can be produced without it when high nitrification can be maintained (whether by summer sowing or by use of sand). Malvi fares best with illumination and P. A. 289F worst with equal nitrogen supply.

Shedding.—With all the varieties, the changes observed were similar to those of bud-production but sometimes differed in degree.

TABLE 21.—*Environment and the development of the cotton plant.*

A. MALVI 9.

Description.	Summer-sown (30-5-34).				Rain-sown (4-7-34).			
	Soil.		Sand.		Soil.		Sand.	
	Un-illumi-nated.	Illumi-nated.	Un-illumi-nated.	Illumi-nated.	Un-illumi-nated.	Illumi-nated.	Un-illumi-nated.	Illumi-nated.
I. *Upto 29th November* 1934.								
1. Total bud production ..	78	144.3	152	162.3	80.5	165	78	8.5
2. Total shedding ..	56	103	107	106	31	77	46	56
3. Interval (days) between date of sowing and beginning of shedding.	90	23	90	41	56	90	56	90
4. Period of shedding (in days)	90	159	90	140	90	56	90	56
5. Rate of shedding (per day) Item 2 by Item 4.	0.62	0.65	1.2	0.75	0.34	1.4	0.44	1.0
6. Percentage of shedding on total bud production	71.8	71.3	70.4	65.3	38.5	46.7	59.0	65.9
7. Yield of *Kapas* in gms...	12.6	0.3	15.3	1.1	1.8	..	..	..
8. Number of mature bolls.	8	0.3	12	1.3	1.5	..	..	..
9. Number of green bolls present on 29-11-34 ..	12	2	3	4	40	6	29	1
10. *Kapas* per boll in gms. ..	1.6	1.0	1.3	0.85	1.2	..	..	..
II. *From 29th November 1934 to 27th February 1935.*								
1. Yield of *Kapas* in gms.	16.2	8.3	7.7	4.3	46.0	5.3	47.2	2.9
2. Number of mature bolls.	12.7	10	7.3	9.3	40	4	22.5	2.5
3. *Kapas* per boll (gms.) ..	1.3	0.83	1.05	0.46	1.15	1.32	2.09	1.16
III.								
1. Total yield of *Kapas* (gms.)	28.8	8.6	23.0	5.4	47.8	5.3	47.2	2.9
2. Total number of mature bolls	20.7	10.3	19.3	10.6	41.5	4	22.5	2.5
3. *Kapas* per boll (gms.) ..	1.4	0.8	1.2	0.5	1.15	1.3	2.1	1.2
IV. *Vegetative growth.*								
1. Shoot-length per bud in inches	2.6	1.9	2.1	1.8	3.0	2.1	2.6	2.2

TABLE 21.—*Environment and the development of the cotton plant.*

B. CAMBODIA INDORE 1.

Description.	May-sown (30-5-34).				July-sown (4-7-34).			
	Soil.		Sand.		Soil.		Sand.	
	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.
I. *Upto 29th November* 1934.								
1. Total bud production ..	105	128.3	136.7	108	77	126	76	63
2. Total shedding ..	91	105	108	93	66	84	58	57
3. Interval (in days) between date of sowing and beginning of shedding	40	22	40	22	58	58	58	90
4. Period of shedding (in days)	142	160	142	160	90	90	90	58
5. Rate of shedding (per day) Item 2 by Item 4.	0.64	0.66	0.76	0.58	0.75	0.93	0.64	0.98
6. Percentage of shedding on total bud production	86.7	81.8	79.0	86.1	85.7	66.7	76.3	90.5
7. Yield of *Kapas* in gms.	11.6	0.7	20.9	..	..	..	..	..
8. Number of mature bolls.	4.7	0.3	7.7	..	..	..	..	..
9. Number of green bolls present on 29-11-34 ..	6	4	8	2	11	11	5	1
10. *Kapas* per boll in gms. ..	2.5	2.3	2.7	..	..	..	..	..
II. *From 29th November 1934 to 27th February* 1935.								
1. Yield of *Kapas* (gms.) ..	12.2	..	9.5	0.6	45.6	19.3	21.5	5.9
2. Number of mature bolls.	5.7	..	5.3	0.3	18	8	10	4.5
3. *Kapas* per boll (gms.) ..	2.1	..	1.8	2.0	2.5	2.4	2.15	1.3
III.								
1. Total yield of *Kapas* (gms.)	23.8	0.7	30.4	0.6	45.6	19.3	21.5	5.9
2. Total number of mature bolls	10.4	0.3	13.0	0.3	18	8	10	4.5
3. *Kapas* per boll (gms.) ..	2.2	2.3	2.3	2.0	2.5	2.4	2.15	1.3
IV. *Vegetative growth.*								
1. Shoot-length per bud in inches	1.8	2.1	1.9	2.3	2.8	2.9	2.1	4.2

TABLE 21.—*Environment and the development of the cotton plant.*

C. PUNJAB AMERICAN P. A. 289F.

Description.	May-sown (30-5-34).				July-sown (4-7-34).			
	Soil.		Sand.		Soil.		Sand.	
	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.	Un-illuminated.	Illuminated.
I. *Upto 29th November 1934.*								
1. Total bud production ..	96	81	90	84	78	35	65.5	68
2. Total shedding ..	61	78	70	79	47	25	51	56
3. Interval (in days) between date of sowing and beginning of shedding	40	40	40	40	58	90	58	90
4. Period of shedding (in days)	142	142	142	142	90	58	90	58
5. Rate of shedding (per day). Item 2 by Item 4	0.43	0.55	0.49	0.56	0.52	0.43	0.56	0.97
6. Percentage of shedding on total bud production	63.5	96.3	77.8	94	60.2	71.4	77.8	82.4
7. Yield of *Kapas* in gms.	17.8	..	15.4	..	3.6	..	1.5	..
8. Number of mature bolls.	7	..	8.7	..	2	..	0.5	..
9. Number of green bolls present on 20-11-34 ..	14	1	2	..	10	..	8	..
10. *Kapas* per boll in gms. ..	2.5	..	1.8	..	1.8	..	3.0	..
II. *From 29th November 1934 to 27th February 1935.*								
1. Yield of *Kapas* (gms.) ..	22.1	..	5.6	..	35.1	..	18.4	..
2. Number of mature bolls.	9	..	3.3	..	14.5	..	6.5	..
3. *Kapas* per boll (gms.) ..	2.5	..	1.7	..	2.4	..	2.8	..
III.								
1. Total yield of *Kapas* (gms.)	39.9	..	21.0	..	38.7	..	19.9	..
2. Total number of mature bolls	16	..	12.0	..	16.5	..	7.0	..
3. *Kapas* per boll (gms.) ..	2.5	..	1.75	..	2.3	..	2.8	..
IV. *Vegetative Growth.*								
1. Shoot-length per bud in inches	2.1	2.7	1.7	3.3	2.8	4.9	1.2	2.5

Illumination hastened shedding in the May-sown plants of Malvi and Cambodia but delayed it in all the July sowings except Cambodia in soil. The rate of shedding in July sowings was generally higher with illumination, differing in degree according to variety.

The percentage of shedding in Malvi plants was increased by May sowing and by illumination on July sowings. It was not affected much by May sowing with Cambodia or P. A. 289F but illumination lowered it for July-sown Cambodia plants in soil but increased it greatly in P. A. 289F.

Total yield of Kapas.—Yields were always depressed by illumination, P. A. 289F suffering most and July-sown Cambodia the least.

The stimulating influence of light did not extend beyond bud-production.

Shoot-length per bud.—Shoot-length per bud was calculated by dividing the total length of all shoots as measured at the end of November by the total number of buds produced up to that time.

Illumination depressed the shoot-length per bud in Malvi but increased it for the American cottons.

July sowings with their greater initial moisture increased shoot-length per bud with both soil and sand for Malvi and Cambodia, but for P. A. 289F, it increased on soil but decreased on sand. Irrespective of variety, season and illumination, shoot-length per bud was depressed by sand wherever yields were high but not otherwise. On the other hand in either sand or soil it rose with yield of Malvi plants and fell with that of American.

There seems to be a particular shoot-length per bud optimum for high-yielding capacity, the actual value being perhaps higher, (*i*) for soil than for sand in the same season and, (*ii*) higher for Malvi than for American cottons growing under similar conditions. This suggests a probability of there being an optimum dry weight production to enable each but to reach maturity.

(*e*) *Crop vigour and seed quality.*—Yield differences in groundnuts (taken as a convenient indicator crop) due to localities were found associated with similar differences in oil contents. Crops from different places varying in yield and oil content showed different proportions of nuts apparently of different quality.

TABLE 22.—*Yield and oil content of groundnuts grown in different localities.*

Variety—Akola 10.

Locality.	Yield in lb. per acre.	% in oil.
Indore	1,566	49.5
Datia	3,050	49.6
Dhar	617	47.0
Bharatpur	483	47.2
Sitamau	....	43.6

The nuts from one crop were sorted into three grades and shelled. The kernels from each grade showed distinct differences in appearance—colour, plumpness, size and brightness and there were very large differences in the oil contents.

TABLE 23.—*Differences in oil content in different grades of groundnut.*

Variety	Akola 10.
Grade.	% in oil.
1st	44.5
2nd	37.2
3rd	30.3

Several replicated field trials were made in 1934 to test if such differences persisted in the succeeding crop and how differences in varietal habit and field fertility would react upon them.

Some of the results have now been examined.

TALBE 24.—*Yield vigour as influenced by seed quality.*

Mean yields in grams per plant.

Grades.	Rich field.				Poor field.			
	Akola 10	Gangapuri	Spanish peanuts.	Total.	Akola 10.	Gangapuri	Spanish peanuts.	Total.
1st grade	46.6	51.7	20.3	118.6	23.8	11.5	15.7	51.0
2nd „	39.6	40.1	17.5	97.2	24.2	13.6	16.9	54.7
3rd „	34.0	45.0	10.4	89.4	22.0	10.5	16.1	48.6
Total ..	120.2	136.8	48.2	305.2	70.0	35.6	48.7	154.3

Significance (1) fields, (2) varieties, (3) grades. $P < 0.05$.

Sig. diff. (1) 72.40, (2) 54.26, (3) 12.72.

Other results are not significant.

Irrespective of variety, high-quality seeds gave higher yields in a rich field but the lowering of yield in a poor field wiped out the differences. Spanish peanuts showed the least yield differences between grades and none between fields—this variety has yielded lowest of those tested. This shows that the difference in seed quality appreciably affects the yields of future crops except when the crop growth is extremely poor. Other observations taken but not yet examined, such as the moisture contents in the nuts and kernels at harvest, and the shelling percentage are likely to reveal how such differences are produced. The seed of a non-responsive variety like Spanish peanut, however, seems to remain un-affected. There is ground for the belief that cotton behaves in the same way as groundnuts.

(*f*) *Cropping power and soil characteristics.*

(i) *Similarities of different soils.*

An attempt was made to find out whether any characteristics could be found common to different soils and tending to increase the yielding power of cotton. Both different types of soil from different tracts and the same type exhibiting differences due to treatment were compared.

Profile samples were collected in the field in Dhar and Jaipur States and at Indore from Field No. 31. Those were compared among themselves and with samples taken after harvest from Cambodia cotton plots at Indore with and without heated soil treatments (50 per cent. in the top 6 inches). Determinations for hygroscopic moisture (50 per cent. humidity), total nitrogen and base exchange capacity were made.

TABLE 25.

Similarities of different soils.

Description of soil.		Hygroscopic moisture % on oven-dry basis.	Total nitrogen % on oven-dry basis. (milligms.)	Base exchange capacity milli. equivalents per 100 gms. of air-dry soil.
Dhar soil	0″-12″	6.34	40.50	49.43
,, ,,	12″-24″	7.57	34.60	50.20
,, ,,	24″-36″	7.20	36.70	46.26
,, ,,	36″-48″	6.43	28.90	47.87
,, ,,	48″-60″	7.70	23.80	50.46
Jaipur soil	0″-6″	1.31	12.7	9.55
,, ,,	6″-15″	1.29	10.4	7.74
,, ,,	15″-24″	2.10	10.6	11.60
,, ,,	24″-36″	2.30	10.7	14.39
Heated soil treatment	0″-6″	3.46	144.00	66.22
	6″-9″	4.57	87.50	74.14
	9″-15″	5.32	86.80	72.86
	15″-21″	4.86	78.39	88.94
	21″-24″	5.01	72.00	74.28
Indore I. P. I. Field 31	0″-12″	7.75	36.00	56.89
	12″-24″	7.10	38.10	52.47
	24″-36″	7.71	28.00	58.05
	36″-48″	6.64	22.50	54.10
	48″-60″	7.48	20.20	56.64
No treatment.	0″-6″	4.75	81.00	82.16
	6″-9″	4.91	66.00	86.28
	9″-15″	6.07	88.00	81.14
	15″-18″	5.81	86.00	74.92
	18″-24″	5.59	59.00	74.70

Hygroscopic moistures were less in the upper than in the lower layers in Jaipur and Dhar soils and greatest in the upper layer of Field 31. Heated soil reduced it.

The total nitrogen content of the Jaipur and Dhar soils was higher in the upper layer but at Indore in the second layer. Heated soil raised it in the upper layer. It also seems that the base exchange capacity is lowered up to 15 ins. depth by the heated soil treatment, perhaps the similar lower level in the Dhar profile is the result of similar processes as the soil type is the same.

The carbon content was less following heated soil and a Cambodia crop ; it increased with manures and to a greater depth with heated soil.

The carbon-nitrogen ratio was lower after a Cambodia crop than Malvi. Heated soil and manures each intensified this difference with Cambodia. The combined effect of heated soil and manure was to raise the C/N ratio, and with Malvi to lower it—below nine inches more than either treatment alone. The increases observed in the C/N ratio may be presumed to be due mainly to the depletion of nitrogen by crop growth either or both by direct absorption and by its influence on soil processes.

The conductivity ratio between one-month and 24 hour water extract shows reduction to a greater depth in control plots with Cambodia than with Malvi. With each variety manure and heated soil separately increased it in upper layers but no further when together.

(ii) *Soil profile changes by cropping and treatments.*

Profile soil samples from the experiment on the influence of open surface texture were sampled after harvest and examined (Table 26, A and B).

Hygroscopic moisture was reduced in the upper layers by heated soil, manure and by the growth of the Cambodia variety.

The total nitrogen distribution seems to show that with heated soil also with a Cambodia crop, manure penetrated more deeply. When Camodia grew with heated soil and manure, the total nitrogen figures show a general reduction indicating its greater utilization. Malvi has exhausted the nitrogen of the heated soil plots, both manured and unmanured, more than the corresponding untreated plots and more than the Cambodia crop under similar conditions. The exhaustion due to Cambodia is greater in the unmanured control than the corresponding manured plots, but not so with Malvi.

Base exchange capacity is reduced by treatment and manures in the Cambodia plots, the reduction in the surface layer being less in the manured plots with heated soil. Compared with Cambodia, Malvi shows lower values in control plots and with heated soil in the upper three-inch layer ; added manure raises them throughout the profile (without heated soil). There seems to be a relationship between the base exchange values and the plot yields, inverse for the preceding year (1933) and direct for the next year.

TABLE 26.

Soil profile changes by cropping and treatments.

A. CAMBODIA.

UNMANURED.

Depths.	HEATED SOIL. Hygroscopic moisture. per cent.	Nitrogen per cent.	Carbon per cent.	C/N.	Conductivity ratio.	Base exchange capacity.	Depths.	CONTROL. Hygroscopic moisture. per cent.	Nitrogen per cent.	Carbon per cent.	C/N.	Conductivity ratio.	Base exchange capacity.
0 – 6" ..	3.46	0.14	0.22	1.96	2.24	66.22	0 – 3" ..	5.16	0.098	0.26	2.63	1.6	82.16
6"– 9" ..	4.56	0.09	0.25	2.92	2.06	74.14	3"– 6" ..	4.33	0.062	0.26	4.2	1.9	..
9"–15" ..	5.32	0.087	0.13	1.05	1.78	72.86	6"– 9" ..	4.90	0.065	0.40	6.2	2.0	86.28
15"–21" ..	4.86	0.078	0.25	3.22	1.78	88.94	9"–15" ..	6.06	0.088	0.30	3.41	2.15	81.14
21"–24" ..	5.01	0.072	0.25	3.33	1.83	74.28	15"–18" ..	5.80	0.086	0.24	2.85	1.9	74.92
							18"–24" ..	5.58	0.059	0.34	5.8	2.0	74.70
MANURED.													
0 – 3" ..	4.33	0.092	0.31	3.4	2.1	67.76	0 – 3" ..	4.20	0.098	0.31	3.23	2.65	66.94
3"–15" ..	4.51	0.075	0.25	3.85	2.08	61.56	3"–12" ..	5.15	0.081	0.14	1.73	2.60	69.69
15"–21" ..	3.84	0.063	0.25	4.0	1.78	66.33	12"–24" ..	4.6	0.075	0.15	2.02	2.2	67.81
21"–24" ..	4.78	0.06	0.29	4.9	1.86	63.69							

B. MALVI.

UNMANURED.

0– 3" ..	5.28	0.090	0.57	6. 4	2.15	64.92	0 – 3" ..	5.61	0.14	0.59	4.10	1.76	69.44
3"–15" ..	7.29	0.064	0.46	7.14	2.38	74.48	3"– 9" ..	5.58	0.11	0.60	5.33	2.35	71.18
15"–18" ..	..	0.084	0.69	8.23	2.00	72.44	9"–15" ..	5.96	0.10	0.37	3.63	2.17	68.50
18"–24" ..	7.88	0.067	0.39	5.86	2.09	78.52	15"–18" ..	5.84	0.10	0.34	3.22	2.68	73.56
							18"–21" ..	6.04	0.10	0.45	4.38	1.92	74.06
							21"–24" ..	6.14	0.11	0.42	3.62	1.85	74.58
MANURED.													
0 – 3" ..	5.52	0.097	0.73	7.5	2.24	72.96	0"– 3" ..	6.49	0.14	1.07	7.90	2.45	71.62
3"– 9" ..	7.69	0.089	0.77	8.5	2.31	69.40	3"– 9" ..	7.22	0.11	0.74	6.92	2.61	72.22
9"–15" ..	7.92	0.067	0.38	5.6	2.13	67.22	9"–15" ..	7.70	0.079	0.69	8.91	2.31	72.24
15"–21" ..	6.29	0.069	0.33	4.8	1.94	70.56	15"–24" ..	7.31	0.070	0.59	8.41	2.07	71.30
21"–24" ..	7.42	0.071	0.53	7.5	1.50	80.02							

The investigation of those soils is being continued by the changes in soil texture, degree of fertility, nutrient content and efficiency of clay complex due to the treatments as well as the residual effect of the crops grown, seem to be clearly reflected and localised in the soil profile. The superficial root system of Cambodia cotton seems to be acting in the same manner as heated soil treatment.

(*iii*) *Soil moistures and crop growth.*—In 1932, observations were taken to estimate the capacity for moisture retention of three typical fields at the Institute, Field 31 (black soil, two to three feet deep), Field 22 (dark grey, two to three feet deep liable to surface wash) and Field 40 (well-drained, light grey and seven to fifteen feet deep). Samples of soil were taken on the 29th August from 0-3 inches depth and a month later from 9-12 inches in addition, after rainless periods of two and three weeks, respectively. Results are given below :—

TABLE 27.

A.

Mean percentage moisture (on fresh basis).

Depths of sampling.	29-8-32.			29-9-32.		
	Field 22	Field 31	Field 40	Field 22	Field 31	Field 40
0″ -3″	29·15	28·85	25.10	22.95	25.18	22.72
9″-12″	..	..	..	22.02	22.67	20.07

Significances :		P.	Sig. diff.
	Fields	<0.01	—
	Dates	<0.01	—
	Depths	<0.01	—
B.	Fields × dates ..	<0.01	1.90
C.	Fields × depths ..	<0.01	1.90

B.

Dates of sampling.	Field 22.	Field 31.	Field 40.	Mean for dates.
29-8-32	29.15	28.85	25.10	27.6
29-9-32	22.95	25.18	22.72	23.62
Mean for fields ..	26.05	27.02	23.89	..

C.

Depths of sampling.	Field 22.	Field 31.	Field 40.	Mean for depths.
0″- 3″	22.95	25.18	22.72	23.62
9″-12″	22.02	22.67	20.07	21.58

On the first date, the surface moistures in Fields 22 and 31 were equal and greater than those in Field 40. A month later, in the first two fields, they were greater than the moistures in lower depths, but not so in Field 40. The moistures in both depths in Field 31 were much higher than those of the corresponding depths in Field 40, but they were higher than those in Field 22 only for the upper layer.

The black soil maintained a higher moisture level, especially at the surface, than the light-grey deep soil while the surface-washed soil showed extreme fluctuation. Previous experience indicated that cotton yields were fairly high in Field 31, fluctuated very much in Field 22 and were low in Field 40.

In 1934, the moisture distribution was studied in other fields during wet spells, Nos. 8 and 20, liable to surface-wash and No. 6, well-drained and fertile, were selected. Observations for soil moisture were taken on 13th August from 0-3 in., and below in three inch zones to 24 in., on patches carrying poor growths and the adjacent areas around them with better growths of cotton and other crops in each field. They were confirmed for the upper zones from data taken a month later. The results are given below :—

TABLE 28.

A.

Mean percentage moisture (on fresh basis) 1934.

Depths of sampling.	Good area.			Bad area.		
	Field 8.	Field 20.	Field 6.	Field 8.	Field 20.	Field 6.
0″–3″	31.1	25.3	23.8	32.6	30.1	28.0
6″–9″	26.0	22.7	23.8	27.3	25.7	25.0

Significances :—

	P.
B. Fields	<0.01
C. Good v. Bad area	<0.01
D. Depths of sampling.. ..	<0.01

B.

Field 8.	Field 20.	Field 6.	Significant difference.
29.2	25.9	25.1	2.5

C.

Good area.	Bad area.	Significant difference.
28.1	25.4	2.04

D.

0–3 inches.	6–9 inches.	Significant difference.
28.5	25.1	2.04

E.

Area.	Depths in inches.				Mean for good v. bad areas.
	0–3.	6–9.	12–15.	21–24.	
Good	26.9	24.4	22.2	22.9	24.1
Bad	31.7	26.5	25.7	24.1	27.0
Mean for depths. ..	29.3	25.5	23.9	23.5	..

Significances :—	P.	Sig. difference.
Good v. Bad area ..	<0.01	1.95
Depths of sampling ..	<0.01	2.20

Field 8 was in general moister than the others. The moisture was highest in the first 3 inches layer, next came 6-9 inches and below one foot it remained at a constant level. Poor areas more moister at each depth in all the fields.

In all the soils examined, precipitation does not seem to move quickly enough to the permanent moist zones below. Hence there always exists in the rainy season a downward gradient of diminishing moisture, during wet spells and in dry intervals even when a thin surface layer of air-dry soil is formed. Thus the surface does not permit all the water to percolate, the excess flows over causing severe surface-wash. The wet weather accumulations and the dry weather losses in the upper foot of the soil vary inversely with its fertility.

Observations on crop growths in the same patches were taken from time to time; the cotton crops were destroyed in both years by excessive rains. The following tables (29 and 30 A-D) include the observations on jowar for 1934 and on wheat for 1933.

TABLE 29.

Jowar crop—good and bad areas, 1934.

——	Good area.	Bad area.	P.	Sig. diff.	Between	r.
Grain in gms. per plant	34.9	12.4	<0.05	19.49	Grain and Heights ..	.999
Heights in inches	76.2	53.1	<0.05	15.63	Grain and Kadbi .	.999
Kadbi in gms. per plant	72.3	20.2	<0.05	39.2	Heights and Kadbi	.999

TABLE 30.

A.

Mean yield in gms. per plant : Wheat—1933.

Description.	Grain.		Bhusa.	
	Early matured.	Late matured.	Early matured.	Late matured.
Field 30.				
Patch 1	27.5	19.6	32.4	25.7
Patch 2	20.8	12.8	25.9	16.4
Field 16.				
Patch 1	22.4	23.6	34.3	36.0
Field 18.				
Patch 1	62.4	14.1	92.0	18.5
Patch 2	34.0	16.0	54.5	27.5
Border	20.5	42.6	24.1	51.7

Significances :—	P.		Sig. difference.	
	Grain.	Bhusa.	Grain.	Bhusa.
Early vs. Late maturity	<0.05	<0.01	—	—
Fields	<0.05	<0.01	—	—
Patches	<0.05	—	—	—
B. (Early vs. Late) × Fields	<0.01	<0.01	1.42	—
C. (Early vs. Late) × Border vs. Patches	<0.01	<0.01	1.27	1.67
D. (Early vs. Late) × Fields × Patches	—	<0.05	—	3.05

B.

Type of maturity.	Grain.				Bhusa.			
	Field 30.	Field 16.	Field 18.	Mean for early and late.	Field 30.	Field 16.	Field 18.	Mean for early and late.
Early	3.02	2.80	6.03	3.91	3.64	4.29	9.16	5.49
Late	2.03	2.95	1.89	2.68	2.63	4.50	2.89	3.66
Mean for Fields.	2.52	2.88	3.95	..	3.14	4.39	6.01	..

C.

Type of maturity.	Grain.		Bhusa.	
	Border.	Patches.	Border.	Patches.
Early	2.56	4.18	3.01	5.98
Late	5.33	2.15	6.46	3.13
Mean for border and patch	3.94	3.16	4.73	4.55

D.

Type of maturity.	Bhusa.			
	Field 30.		Field 18.	
	Patch 1.	Patch 2.	Patch 1.	Patch 2.
Early	4.05	3.24	11.50	6.81
Late	3.21	2.05	2.31	3.44

The grain, heights and Kadbi of jowar plants were greater in the good areas than in the bad. In all fields, portions of wheat crop were always observed to show delayed maturity in plants growing on patches inside the field which remained moister in the monsoon and also for those along the borders which were not so moist. It was found in 1933 that these late-maturing plants inside the field yielded less than early plants around them but the late plants along the border yielded better than their neighbours and as well as the early plants inside the field. The early border plants yielded more grain and as much Bhusa as the late plants of the inside patches. It is thus evident that moist patches depress the yields of the succeeding *rabi* wheat and also delay its maturity.

Comparing the two groups of late plants the lateness of the moist-patch plants seems to be due to their weakened vigour; that of the border plants is not due to weakening but presumably to their ability to tap more water in the absence of competition, and in spite of their prosperous appearance their yield is only equal to that of the early plants inside the field.

It appears that vigour and health of crops are determined by the soil capacity for free water movement in wet weather in the first foot and moisture retention in dry weather. This is why texture improvement by humus-supply shows superiority over other methods.

(*iv*) *Regional soil profiles—some comparisons.*—The ability of Badnawar (Dhar) and Jaipur soils to grow healthy crops of Cambodia cotton and the higher nitrifying activity in Jaipur soils compared with those of Indore suggested a detailed study of typical profile (five feet deep) from each region.

The usual mechanical and chemical analyses were made, and hygroscopic moistures, maximum moisture—holding capacity, and available potash and phosphates were deter-

mined, the latter in inorganic and organic forms. Some of the oustanding differences are noted below :—

TABLE 31.

Differences in profile characters.

A. MECHANICAL.

Percentage of.	Jaipur profile.		Badnawar profile.		Indore profile.	
					Field 31.	
	1st zone 0–6″.	2nd zone 6″–15″.	1st zone 0–12″.	2nd zone 12″–24″.	1st zone 0–12″.	2nd zone 12″–24″.
Coarse sand ..	2.73	1.92	0.80	0.68	0.24	0.87
Clay	6.15	7.35	16.35	29.90	41.60	35.95
Co_2	0.02	0.02	2.53	1.58	0.44	1.45

B. CHEMICAL.

Available in the first zone.

Soils.	Per cent. Total N.	Per cent. available P_2O_5	Per cent. available P_2O_5 on total.	Per cent. on available P_2O_5		Ratio, org. to Inorganic P_2O_5
				Inorganic P_2O_5	Organic P_2O_5	
Jaipur	0.013	0.0075	19.95	16.00	84.00	5.25
Badnawar ..	0.041	0.0407	28.87	21.87	78.13	3.58
Indore F. 31 ..	0.036	0.0332	47.69	23.74	76.26	3.21

C.

Available potash in the first zone.

Soils.	Per cent. available K_2O	Per cent. available K_2O on total K_2O
Jaipur	0.0248	22.15
Badnawar	0.0419	7.26
Indore	0.0287	5.51

D.

Ratios of available nutrients in the first zone.

Soils.	N to av. P_2O_5	N to av. K_2O.	av. P_2O_5 to av. K_2O	Available.		N to Inorg. av. P_2O_5.	N to org. P_2O_5.
				Inorg. P_2O_5 to K_2O.	Org. P_2O_5 to K_2O.		
Jaipur ..	1.73	0.52	0.30	0.05	0.25	11.06	2.06
Badnawar ..	1.01	0.96	0.97	0.21	0.76	4.61	1.29
Indore ..	1.08	1.25	1.16	0.28	0.88	4.56	1.42

The proportion of coarser fraction was greater and that of clay less in the top zone than below in Jaipur and Badnawar soils and *vice versa* in Indore soils.

Carbonates gradually increased with depth in Jaipur. In Badnawar soil the percentage was high in the top zone and low in the Indore soil; in each it then alternated in successive lower layers.

The percentage of available phosphates on total was least in the Jaipur surface zone and greatest in that of Indore. Always more than 75 per cent. of the available phosphate was in the organic form and this was highest in the surface horizon of the Jaipur profile and lowest in Indore; both its absolute percentage and its ratio to the inorganic form were highest in Jaipur and lowest in Indore soils.

Similarly the available proportion of total potash was highest in Jaipur and lowest in Indore soils.

In Jaipur and Badnawar soils much more potash was available in proportion to nitrogen than in Indore soils. In the same way, in proportion to phosphates, both organic and inorganic, the largest amount of potash was available in Jaipur soils and least in Indore soils.

These differences seem to be interesting in the light of the results discussed in the cotton wilt section of this report (9) (*a*) and those on nutrition (9) (*b*), (*c*) and (*d*).

10. Crops other than Cotton.

(*a*) *Plant Breeding.*—Study of the crops of Central India and Rajputana immediately reveals the great importance of local adaptation. This is shown in the frequent failure of varieties in trials carried out outside their native tracts, and by the failure of types brought into the Institute's plant breeding plots from outside district even though these may apparently belong to the same tract. It follows that if the Institute's plant breeding work is to be of value to the whole of the area served, it must be carried out in such a way that advantage is taken of the selective action of local environments. Methods of selection are therefore being studied with a view to devising a technique simple enough and rapid enough to be carried out by busy local officers with the assistance of one or two advisory visits per annum from members of the Institute's staff. This work has been started both at the Institute and at outstations on Jowar (Sorghum), Bajra (Millet), Tur (pigeon pea), Tilli (Sesamum), Niger, Groundnut, Wheat, Barley, Linseed and Gram. The past years' results with the *kharif* crops have already been analysed and are very encouraging.

(*b*) *Botanical.*—The developmental study of bread and durum wheats was carried out in the *rabi* season, and the data await analysis. It is not expected that any further experimental work will be required.

(*c*) *Cytological.*—The development of more profitable lines of work has made necessary the postponement of work on the chromosome number of gram. Chromosome numbers of Indian and Moroccan linseeds were determined in root tip material and were found to be the same in both types.

(*d*) *Fodder Plants.*—A list of the natural fodder plants occurring in the neighbourhood of the Institute has been compiled, and is available for the assistance of those engaged in agronomic work on fodder improvement.

(*e*) *Tobacco.*—It is now definite that all types of tobacco, including cigarette types can be grown satisfactorily on any soil in Malwa and in Rajputana and Bundelkhand. The possibility of curing yellow leaf under grass is finally established, and leaf of good quality can be thus produced. Local methods of curing *desi* tobacco have been improved to ensure greater uniformity and quality. A large-scale experiment to find out the economics of the culture of flue-cured tobacco has been undertaken this year in co-operation with the Dhar Durbar, whose enterprise in this matter is much to be commended. The production and grading of the seed have been systematized. The raising of seedlings and cultivation have been improved and made simple. It has been found possible by ratooning to make up for the loss of the crop by frost wherever one or two irrigations can be given. It is also considered that tobacco cultivation can be made more profitable by systematic ratooning of a normal crop.

(*f*) *Rice.*—Large-scale trials in several parts of Malwa have been undertaken as a preliminary to final recommendation for distribution. It has been found possible to grow a profitable crop of wheat or tobacco following, in the same year, rice grown by the Indore method in which no irrigation or puddling is given. It is remarkably responsible to manures and very high yields have again been obtained of five varieties.

(*g*) *Sugar-beet.*—Closer spacing increases yields. The crop responds well to artificial manures. The ease and practicability of drying a crop on a large scale has now been proved. The hand-slicer designed at Indore has proved very satisfactory.

(*h*) *Sugarcane.*—Co. 290 is decidedly the best variety of those so far tried, for all districts in Central India and Rajputana. The Sorghum crosses and some other early varieties imported from Coimbatore have matured in seven months. It seems possible to extend the season for harvesting sugarcane by growing a judicious selection of early varieties to supplement Co. 290. The cultivation of sugarcane has been further improved and made simple and cheaper. Replicated experiments on manuring and irrigations, ratooning and associated growth of varieties are being carried out.

(*j*) *Lucerne.*—It has been found possible to reduce the cost of seed and irrigation by drill-sowing and implement culture. Good viable seed has now been produced locally.

(*k*) *Preliminary small growth tests on various crops.*—Kudzu vine, *kolingi*, tepary beans and jute can be easily grown. Guinea grass, *khavi* grass, Wimmera Rye grass and Teff grass seem to stand even the hot weather drought just like other local grasses and appear again with the next rains. Soya beans are now being tested for large-scale cultivation in Malwa and Bundelkhand—they seem to suit the latter area peculiarly well.

11. Statistics and Field-trial Technique.

Four papers on the technique of field-trials, chiefly with reference to cotton, have been written and submitted for publication. Studies of sampling technique for the estimation of yield and of morphological characters are in progress. The work of testing named varieties of the chief crops of Central India and Rajputana is almost finished, and a report of the results obtained and the recommendations made is in preparation. The problem of simplifying field-trials to improve their suitability for out-stations where detailed scientific control is not possible is receiving attention.

In the season under review the randomised block technique was successfully applied to the problem of testing progeny rows in plant breeding work. Problems arising out

of the necessity of using very small plots, the very different amounts of seed available in different progenies, and the effect of dispensing with plot margins are being studied, and the first results will be ready for publication shortly.

12. Miscellaneous.

(*a*) *Agronomic survey.*—A great deal of information has been collected about the present status of farm crops in relation to their environment and the local economy in Central India and Rajputana. Revenue Department records—a mine of information not yet much exploited in agricultural science—have been freely drawn upon, thanks to the willing co-operation of the State officers concerned.

(*b*) *Soil erosion.*—Experience has shown that the system on which the Institute Farm was laid out—rectangular fields graded to a uniform gentle slope of limited length and served with border drains—does not prevent serious erosion in the rains. The method of contour bunding, utilizing suitable perennial plants in strips to arrest water-borne silt is being tried extensively to adapt it to local conditions. A number of plants have been tested for this purpose.

(*c*) *Eradication of kans and other weeds.*—It was noticed in the making of rain-watered compost that all vegetation under the heaps of decomposing wastes was killed after being covered for a month or less. Small-scale field trials with covers of green grass or sann hemp showed the same effect and an attempt is now being made to join the function of weed killing to that of green manurings, if successful this promises to be the cheapest means of weed control, costing far less than mechanical and chemical methods used.

(*d*) *Dry farming and humus supply in arid regions.*—Following up the results of qualitative tests on the Jaipur State Farm replicated experiments are now laid down to find the best way of retaining the deficient rainfall so as to make possible cotton and other such crops by ensuring the necessary water-balance in the crop up to maturity.

(*e*) *The use of heated soil.*—The efficacy of heated soil is being tested to enable satisfactory growth of exotic and *desi* cotton varieties which are at present difficult to grow in local black soils. A replicated experiment is also being carried out to compare the efficacy on American and *desi* cottons of heated soil with ammonium sulphate when supplied in combination with phosphatic compost.

A simple technique has been devised to make heated soil cheaply in the field with the help of available crop residues.

(*f*) *Poisoned bait for white ants, etc.*—The composition of the baits has been improved to make them more attractive and efficacious. Field trials are in progress to determine utility and cost.

13. Compost Manufacture.

(*a*) *Farm refuse.*—The rain watered process of compost-making has been applied to the utilization of cane trash and an account published which is being reprinted as Institute Bulletin No. 3. Work has been started to devise a technique for composting cane trash during the dry weather and also for utilization of molasses. Another modification recently devised enables residues rich in material of the softer type to be composted without the use of cattle dung and composting is being introduced with entire success in Military stables in the Holkar State.

The method of charring and crushing bones for use as manure either alone or in the form of compost has been systematized.

(*b*) *Habitation wastes.*—It has been found possible to reduce by about 50 per cent the breeding of fly larvæ on the surface and sides of decomposing heaps even in wet weather by spraying 1 per cent copper sulphate solution after charging and after the first turn. About 2½ lb. of copper sulphate per foot-length of the charge are required. This reduction is only obtained if the technique for charging and first turn is carefully followed. The

addition of such material does not seem to affect the quality of the compost. The extra expenditure and manipulation involved appear to be of doubtful utility in practice because in any case such larvae are destroyed after the first turn if the process is properly carried out.

Widespread interest has been displayed in the process by Public Health Officers, Municipalities and others both in India and abroad, enquiries are constantly being received, over 500 copies of the Bulletin (No. 1) describing it have been sold and the first edition of 1,500 copies is now exhausted.

(*c*) *Use of compost.*—A method has been devised and is being tried on a field scale to raise the fertility of *barani* (*mal*) lands more nearly to the level of that of garden lands (*adhan*) by applying manure or compost uniformly in the deeper layers in addition to surface dressings.

14. Publications.

The following papers have been published or submitted for publication :

" The health and vigour of the cotton plant in relation to its environment "—Report 2nd Conf. on Cotton Growing Problems, July 1934; Empire Cotton Growing Corporation.

" Silage making in Mud-walled Towers "—G. C. Tambe and Y. D. Wad ; Empire Cotton Growing Review, XI, 1934, No. 4.

" Humus manufacture from cane trash "—G. C. Tambe and Yeshwant D. Wad ; International Sugar Journal, XXXVII, 1935, pp. 260-263.

" Some observations on the Inheritance of Form and Size in Asiatic Cottons ", by J. B. Hutchinson (To be read at the VIth International Botanical Congress, Amsterdam, September 1935).

" The Classification of Gossypium with special reference to the cottons of the Old World," by J. B. Hutchinson and R. L. M. Ghose.

" Studies in the Technique of Field Experiments," by J. B. Hutchinson and V. G. Panse.

(I) " Size, shape and arrangement of Plots in Cotton Trials."

(II) " Sampling for Staple Length Determination in Cotton Trials, with a Note on the Standard Error of Estimates of Ginning Percentage."

(III) " An Application of the Method of Co-variance to Selection for Disease Resistance in Cotton."

(IV) " A Study of Margin Effect in Variety Trials with Cotton and Wheat."

" A Note on the Inheritance of Sterility in Cotton " by J. B. Hutchinson and P. D. Gadkari.

" Nitrogen Balance in Black Cotton Soils in the Malwa Plateau II " by Y. D. Wad and R. K. Aurangabadkar.

Institute leaflets issued or revised during the year :—

No. 5.—" Improved method of gur manufacture " (English and Hindi, illustrated).

No. 7.—" Lucerne Cultivation " (English and Hindi).

No. 9.—" Cultivation of cotton in Gang Canal Colony " (Urdu).

No. 10.—" The Preparation of Bone-char Manure " (Eng.).

No. 2.—" The making of Rain-watered Compost Manure from Farm Wastes " (English and Hindi). Revised June 1935, with one illustration.

The following papers were read at the 1935 Session of the Indian Science Congress, Calcutta :—

" Influences dominating cotton yields in Monsoon Areas—I ", by Kubersingh and Y. D. Wad.

" Nitrogen Balance in Black Cotton Soils in the Malwa Plateau—III ", by Y. D. Wad and R. K. Aurangabadkar.

" Provision of Succulent Fodder for Work-cattle in Central India," by G. C. Tambe, Chironjilal Nagar and T. Krishnamoorthy.

" Agronomic Adjustments of the cotton crop in Gang Canal Colony, Bikaner State," by Shamsher Singh and Y. D. Wad.

THE WORKING OF THE FARM.

15. Experimental Work.

(*a*) *Nature of the season.*—As usual the monsoon broke in the last week of June and the sowing started on the 26th. On the 27th and the 29th there was a heavy downpour. The fall up to the end of July was 18.9 inches—more than half the average for Indore. The next month was equally wet throughout, the total having gone up to 40.07 inches. In September 16 inches of rain fell with a couple of breaks. In October there was no rain. November 5th recorded a fall of 1.34 inches. In January a cold wave lasted for four days. The temperatures recorded were as follows :—

1935 January	..	12	50° F.
,,	..	13	40° F.
,,	..	14	34° F.
,,	..	15	29° F.
,,	..	16	29.5° F.
,,	..	17	31.5° F.
,,	..	18	31.5° F.
,,	..	19	37.5° F.

(*b*) *Field Trials.*—The following experiments were conducted on the Farm :—

Humus supply.—(1) Incorporation of organic matter in the soil. (2) Effect on wheat of green manuring with sann at different stages. (3) Improvement of water-logged soils for *rabi* crops.

Soil improvement.—(1) Improvement by the application of lightly heated soil. (2) Control of soil erosion by contour line sowing and the use of arrester crops.

Soil texture and Crop growth.—(1) Winter cultivation of crops (1932, 1933, 1934, 1935). (2) Estimation of the relative importance of weeding and interculture (1934, 1935). (3) Comparison of the efficiency of different implements of interculture (1933, 1934, 1935).

Rotation.—(1) Rotation of crops (1932, 1933, 1934, 1935).

Associated growth of crops.—(1) Association of cotton with soya beans and cowpeas. (2) Spacing test on tur and its association with cowpeas.

Weed eradication.—(1) Eradication of kans by chemical means.

Treatment of seed.—(1) Trial of Agrosan " G " against Jowar smut.

Multiplication of seed.—(1) Soya beans of 32 varieties in *kharif*. (2) Soya beans of 6 varieties in *rabi*. (3) Paddy varieties 7 (followed by wheat).

Paddy variety.	Date of harvest.	Paddy yield. mds.	Wheat yield. mds.
Shahjanpur 23	2-10-34	12.0	8.68
,, ...	,,	15.7	9.85
Shahjanpur 1	,,	9.3	9.00
,, ...	,,	10.6	12.40
Johna	,,	12.5	10.30
,, ...	,,	4.3	6.70
,, ...	,,	29.3	6.70
Datia	15-10-34	16.0	4.60
,, ...	,,	15.4	4.15
,, ...	,,	11.4	4.27
Bhatta Gurmatia	29-10-34.	16.3	4.80
,, ...	,,	14.4	4.50
,, ...	,,	14.9	4.66
Mushkan	8-10-34.	12.6	10.00
,, ...	,,	17.2	5.40
Pahan	10-10-34.	9.0	5.45
,, ...	,,	4.2	7.60

Paddy not irrigated.

Wheat—2 irrigations.

Small growths.—(1) Oats for fodder. (2) Bagilla fodder.

Sugarcane.—(1) Multiplication of promising acclimatised Coimbatore varieties and also Sorghum crosses. (2) Varietal trial on S48, Co210, Co213, Co281 and Co290. (3) Agronomy trial on S.48.

Lucerne.—(1) Inoculation of seed. (2) Manurial trials. (3) Agronomy trial.

Sugarbeets.—(1) Trials in different soils under dry and irrigated conditions.

Pasture Studies.—(1) Response of grasses to various manures.

Compost.—(1) Preparation of phosphatic compost. (2) Composting cane trash. (3) Composting cowdung alone.

16. *Crops and Yields.*

	Yields in mds. Max.	Per acre. Min.
Dry crops.		
Cotton	3.6	1.4
Jowar	9.7	0.4
Tur	5.4	0.3
Groundnuts—		
Gangapuri	13.1	1.1
Akola 10	5.5	0.9
Wheat (Malvi)	9.5	2.0
Gram (Malvi)	9.0	1.0
Linseed	4.5	3.7

			Yields in mds. Max.	Per acre. Min.
Irrigated crops:—				
Paddy (mushkan)	....	29.0 mds.	12.6 Plot size 50′×20′.	
Sugarcane: Co210	....	534.6 ,,		
Co213	....	464.7 ,,		
Co281	....	445.0 ,,		
Co290	....	610.9 ,,		
S.48	....	318.7 ,,		
Lucerne agronomical.				
Year. Season.	Cuttings.	Plot yield in lb.	Total per acre in lb.	
1932-3 .. Winter	2	5,480		
Summer	6	27,876		
Monsoon	3	7,180		
			45,040	
1933-4 .. Winter	4	10,133		
Summer	5	10,053		
Monsoon	2	3,443		
			26,250	
Lucerne manurial.				
1932-3 .. Winter	1	5,307		
Summer	5	23,513		
Monsoon	3	4,129		
			47,970	
1933-4 .. Winter	4	9,189		
Summer	5	13,858		
Monsoon	2	4,583		
			39,470	
Peas (green pods)	8.8 mds.			
seed	2.6 ,,			

The calculated gross returns from the Farm amount to Rs. 5,000. The wet weather coupled with the cold wave reduced this figure seriously.

17. *General.*—(*a*) *Live Stock.*—There are 15 pairs of bullocks in all including 6 purchased to replace those that through old age became unserviceable or died. The new pairs are of average size usually found with cultivators.

460 cartloads of compost were prepared from the available farm wastes and 32 cartloads of night-soil compost from the residential block (population about 100).

1,145 mds. of silage from grass and legumes were made. This provided an excellent succulent fodder for the hot weather.

(*b*) *Workshop.*—This section continued to render useful service in the same directions as reported last year. The sugarbeet slicer devised in the previous year was further improved upon.

A portion of the fence line was repaired and the wood-work of the buildings repainted.

(*c*) *Irrigation.*—A persian wheel was installed in place of the Boulton Elevator worked by engine power for purposes of demonstration and economy.

One of the wells capable of commanding a fair area had been out of use on account of its dilapidated condition. The debris was removed and the well cleaned and repaired. Now there is one good well and two of moderate capacity in the ' C ' block of the farm.

(*d*) *Trading Section.*—This section was very busy and considerably more sales than those of the last year were effected in implements, tools and seeds. The demand for the improved seed exceeded the supply.

(*e*) *Training of students and help to cultivators.*—In all about 120 students from the following States were given training in either practical agriculture or composting farm and habitation wastes :—

Alwar.	Rewa.	Hyderabad (Dn.)	Bundi.	Tonk.
Chhatarpur.	Udaipur.	Jodhpur.	Indore.	
Jaora.	Bharatpur.	Rutlam.	Nowgong.	

According to the status, the students can be classed as under :—

Normal School Boys	75
,, ,, Teachers	3
State officials connected with agriculture ..	12
Municipal officials and menials	10
Army officers Holkar State	6
Union Theological Seminary students for rural propaganda	15

Trained ploughmen were deputed to various States to teach compost making and *gur* making by the improved method. Many cultivators came directly for information and help showing their confidence in the work.

Propaganda and Extension Work in States.

18. *Visits to States.*—During the year under report, the Agricultural Adviser made sixteen visits to States, the Extension Officer nineteen, the Geneticist and Botanist seven, the Chemist and Agronomist eleven, and other officers thirteen.

19. *Instructional and training facilities.*—No fixed lecture courses are provided but practical training is given at the request of the Darbars to members of their Revenue and Agricultural staffs and selected cultivators, the programme of instruction being varied in its items to suit individual cases. No fees are charged and free accommodation is usually provided in the Institute's Visitors' Quarters.

Special lectures and demonstrations were arranged for repeated visits from the Kumars of the Daly College (for sons of the Ruling Princes and their relatives) and from the students of the Canada Mission's Theological Seminary, their Rasalpura Vocational School and the Holkar State's Normal School for training rural teachers. Such contact with those who will later be able to encourage agricultural improvement is a matter of great importance.

With the co-operation of the Indore Residency Area authorities training in the Sanitary disposal of habitation wastes by the Institute's composting process has been given to municipal staff from seven member-States, Hyderabad (Deccan) and Chhatarpur States and Nowgong Cantonment, a fee being charged to non-members. Officers from five units of the Holkar State Army were also trained in the process and in that for composting stable refuse. The Secunderabad Cantonment requisitioned the services of a trained assistant for a month to make certain adjustments in the process desirable under the local conditions and to help in the laying out of new disposal grounds under the system.

Lectures and demonstrations were given by the Extension Officer in district tours in eight States. To large village audiences he explained the advantages of growing good crop varieties, of increasing their manure supply by making rain-watered compost from waste, of making grass, *juar* or *bajra* silage for their cattle, using mud-walled towers where pits become water-logged, the practical possibility of improving their cattle by castrating "Serub" bulls, the lower cost of making better quality *gur* by the McGlashan furnace and a variety of other improvements within the capacity of ordinary cultivators. The services of ploughmen trained in building the McGlashan furnace and in *gur* making were placed at the disposal of the Darbars and were freely used.

Assistance was also given by the Extension Officer in organising demonstrations at twelve agricultural shows and cattle fairs in eight States. Illustrative exhibits were provided, lectures given and cinematograph films shown on agricultural and rural uplift subjects accompanied by running commentaries.

At a public meeting in Jaipur presided over by Lt.-Col. Sir H. Beauchamp St. John, K.C.I.E., C.B.E., Vice-President, Council of State, the Extension Officer explained the work and objects of the Institute to a large audience of landowners, State officials and cultivators; cinematograph films were also shown.

Acknowledgment is due to the Indian Central Cotton Committee and the Central Publicity Officer, Railway Board, for the free loan of films.

F. K. JACKSON,
Director.

STAFF AND RESEARCH STUDENTS OF THE INSTITUTE OF PLANT INDUSTRY AS ON JUNE 30TH, 1935.

Administrative and Clerical.—

Director and Agricultural Adviser to States in Central India and Rajputana	F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.).
Personal Assistant	A. N. Srivastava, M.Sc.
Head Clerk and Accountant ..	G. M. Nadkarni.
2nd Clerk	Mohiuddin Khan.
3rd Clerk	S. M. Ajmi.
4th Clerk	S. M. Azim.
5th Clerk	V. R. Shirsath.
Artist	S. J. Oncar.
Librarian	Bashir Husain Khan.

Botanical.—

Geneticist and Botanist ..	J. B. Hutchinson, M.A. (Cantab.).
Senior Botanical Assistant ..	R. L. M. Ghose, M.Sc.
Plant Breeding Assistant ..	Kuber Singh, B.Ag.
Botanical Assistant	Vacant.
Statistical Assistant	V. G. Panse, B.Sc.
Genetical Assistant	Bholanath, M.Sc.
Computor	S. A. Khargonkar.
Fieldman	E. L. Rajanna.
Research Student	G. K. Govande, M.Sc.*
,, ,, ...	M. A. Ansari, M.Sc.*
,, ,, ...	P. D. Gadkari, M.Sc.*
,, ,, ...	Maya Prakash Singh, M.Sc.†
,, ,, ...	B. S. Kochrekar, B.Ag.†

Chemistry and Agronomy.—

Chemist and Agronomist ..	Y. D. Wad, M.A., M.Sc., A.I.I.Sc.
Laboratory Assistant	L. N. Desai, B.Sc.
,, ,, ...	G. T. Shahane.
,, ,, (Temporary)	V. V. Dravid, B.Sc.
,, ,, (,,)	S. J. Ghose.
,, ,, (,,)	G. K. Sant, B.Sc.
,, ,, (,,)	P. M. Kulkarni, B.Sc.
,, ,, (,,)	B. Goswami, B.Sc.
,, ,, (,,)	R. S. Gharpure, B.Sc.
Research Assistant (,,)	I. Madhusadan Rao, M.A.
,, ,, (,,)	Chironjilal Nagar, B.Sc.
,, ,, (,,)	V. N. Bhargave, B.Sc.
Research Student	R. K. Aurangabadkar, M.Sc.*
,, ,, ...	S. C. Chakarvarty, M.Sc.*
,, ,, ...	K. N. Ambegaonkar, M.Sc.*
,, ,, ...	S. B. Mogre, M.Sc.*

Propaganda and Extension Work.—

Extension Officer..	M. L. Saksena, L.Ag.

* Institute of Plant Industry Studentship.

† Voluntary research worker.

Farm Executive.—

Farm Superintendent	G. C. Tambe, B.Ag.
Assistant Farm Superintendent	S. C. Talesara, B.Ag.
Junior Farm Assistant	G. G. Phadke, L. Ag. (on deputation to Bharatpur State as Agricultural Officer).
„ „ „	N. S. Apte, B.Ag. (Actg.).
„ „ „	K. M. Simlote, B.Ag.
Fieldman	Nihalsingh.
„	V. R. Sathe.
„	G. M. Nigudkar.
Storekeeper	V. S. Dravid.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Research Programme for 1935-36.

A. Genetics and Botany Section.

Cotton.

(1) *Botanical Survey.*—Owing to delay in despatch of the specimens promised by the Botanical Survey of India, the contemplated paper on the classification of Asiatic cotton will probably have to be completed in 1935-36.

(2) *Genetics.*—Study of inheritance of major factors in Asiatic and Indian American cottons.

Study of cases of abnormal inheritance of major factors.

Study of the inheritance of quantitative characters.

Study of interspecific hybrids with special reference to the bearing of heterosis on plant breeding procedure.

Study of the rate of mutation in mutable strains.

(3) *Cytology.*—Study of sterile types derived from an interspecific hybrid. (G. arboreum × G. herbaceum).

Study of chromosome behaviour in F1, F2 and backcrosses of G. africanum × cultivated Asiatic cottons.

(4) *Physiology.*—Study of cotton hair characteristics.

Development of tests for lint quality suitable for the needs of the plant breeder.

(5) *Selection and Breeding.*—Propagation and distribution of Malvi 9. Study of variance in Malvi 1, Malvi 9, and the cross between them, and re-selection for further propagation, according to the results obtained.

Study of and re-selection in progeny rows of 1933 selections.

Study of problems of transference of herbaceum quality to Malvi type.

Study of Cambodia selections grown at Badnawar.

Study of selections in Nimar *desi* made in 1933 and grown in 1934 at Dhamnod.

(6) *Variety Trials.*—Variety trials will be laid down at the Institute and in the territory of member-States as found necessary in the light of results obtained from current trials.

(7) *Statistics.*—The investigations in progress into statistical problems involved in field testing, strain testing where very small quantities of seed are available, and in the examination of segregating progenies, will be continued.

Other Crops.

Work on other crops will be largely confined to the selection and purification of desirable high yielding strains for the main areas served by the Institute, and fundamental research will usually be restricted to cotton. Exceptions from this rule will occur from time to time when opportunities arise of solving general problems more easily than could be done on cotton, and plant breeding material will, of course, be used to the fullest possible extent to provide data of scientific value.

(1) *Botanical.*—Comparative developmental study of durum and bread wheats.

(2) *Genetics.*—Study of inheritance of certain characters in local durum wheats.

(3) *Selection and Breeding.*—Selection and breeding work will be continued on the following crops :—

Kharif :—	*Rabi* :—
Jowar.	Wheat.
Bajra.	Barley.
Tur.	Gram.
Tilli.	Linseed.
Niger.	Kesari.
Groundnut.	Safflower.

A part at least of the breeding material in these crops will be grown on the farms of member-States.

(4) *Variety Trials.*—Variety trials on all crops of interest to member-States will be laid down in the light of information gained from the current season's experiments.

(5) *Lathyrism.*—Work on Kesari has been resumed, and in connection with it, the botanical and agricultural problems involved in the growth of the associated weeds responsible for lathyrism will be studied.

B.—Chemistry and Agronomy Section.

Continuation of the present work.

Reviewing of accumulated data and writing up the summarised results.

The main feature of the future programme will be considerable increase in laboratory and cultural work side by side with accurate field observations in addition to extensive field experiments of a complex nature. In many cases, suitable technique is not available and will have to be evolved.

'Leaf-roll' and 'Red leaf' of American Cottons.—The material collected will be further examined and the results summarised. Work at the Institute has now shown clearly that these phenomena result from certain changes in soils and seasons which are normal to the locality where leaf-roll and red leaf occur. Control of these causative soil-changes has already been achieved in practice at the Institute and the further work intended will be aimed at making control still more widely practicable.

Bio-chemical studies on 'wilt.'—The information so far collected will be summarised and further studies will be started to elucidate changes both in the plant and soil which seem to favour the incidence and progress of the disease.

Factors governing the yield of cotton.—The data will be summarised for publication and in the light of the results further experiments will be arranged to estimate the relative value of possible modifications in field practice. The influence of the water-supply upon the spinning and other qualities of cotton will be further investigated following the clues obtained from Ganganagar results.

Crop-vigour and seed composition.—This work is to be continued. Studies similar to those on groundnut will be made on linseed and wheat for comparison with those on cotton. The work projected in the 1934-35 programme on *Reaction changes in sap* and on *Ripening of cotton bolls* has been suspended, in favour of soil fertility studies which seem likely to give profitable results earlier.

Other factors.—The preliminary results will be reviewed for publication and further work planned mainly with a view to get an estimate under controlled conditions of the disturbances in vigour and health of *desi* and American cottons commonly observed in the field. A study will also be made, if possible, of the likely share, in determining the health and vigour of the cotton plant, of disturbances in the respiration of roots which appear to take place in the field.

A beginning will be made to study the relative influence of the course of nutrition and its balance during the early stages of cotton growth, on its period of maturity as well as cropping vigour and quality, following the clues secured from the tests made during this year both with cotton and other indicator-crops. Sugar beet and Pyrethrum have been found very useful as they give rapid indications. These studies will include both potcultures and field experiments.

Nitrogen-balance in the field.—Further aspects of this problem will be taken in hand.

General soil studies.—Results will be summed up for publication.

(1) Three more soil types in their important phases will be taken up. The soils in hand will be examined further.

(2) Soil samples from field experiments will be examined.

(3) Water-regime of the black soils of Malwa during rains and the arid soils of Bikaner throughout the year will be studied in a preliminary way.

(4) The movement and changes in the solubles will be similarly studied at both places, with special stress on important environmental phases usually prevailing in the local cotton fields during the season.

(5) The study of the alterations by surface treatment of the soil profile as well as the influence of the growing crop upon it will be pushed further.

(6) The changes and fluctuations in soil properties at different periods of the crop season will be estimated item by item.

(7) A measure of the seasonal changes in the physical conditions of natural soils will be taken, with reference to the causative factors and resulting effect on the exchange status, availability of phosphates and changes in organic matter.

Soil studies in relation to plant growth.—(1) Attention will be concentrated on estimating the influence, on the final yield of the local cotton crop, of the several checks during wet spells and the extent to which they may be affected by soil conditions.

(2) The work already in hand upon plant growth in rich and poor patches in the same field is to be continued with a few alterations.

Rotation.—It is intended to make a more comprehensive attack on the fundamentals of this problem and hence in addition to the present work attempts will be made to assess the positive or negative residual effect of individual crops on the soil and also to develop a profitable and convenient system for the simultaneous growth of two or more crops.

Water-logged soils and erosion.—A few fields will be put under the control methods found promising in order to estimate the rate and extent of probable improvement in fertility.

Eradication of weeds.—Trials will be made of several promising methods on a rather larger scale.

Control of white ants.—A method will be sought to make the bran bait harmless to men and livestock.

Opium crop substitutes.—After the review of the information collected definite systems will be recommended and additional improvements at present in contemplation will be pushed further.

Supply of fodder.—A start will be made to test the influence of erosion control on grasslands. Some of the promising grasses will be tested for their hardiness and their capacity to compete with established varieties. Fresh varieties will be imported for preliminary trials.

Further improvements in compost-making.—Composting of cane trash with artificial watering in dry seasons will be adjusted for large scale operations with particular emphasis on the utilisation of molasses.

Preliminary trials will be made to develop properly-balanced, as well as quick-acting, composts with a view to utilise them for reducing the degree of soil deterioration during the period of crop growth. A good deal of theoretical work will have to be done in the beginning.

Root-studies.—Further adjustment in the technique for different purposes will be made. An interpretation of the large number of drawings collected will be continued.

Soil microbiology.—The influence on the biological population of soils, of the conditions hitherto found prominently affecting the health and vigour of crops will be studied.

Note.—It will be noted that in the above programme attention is either restricted to gaining a general idea or concentrated upon details of a particular aspect, depending upon the present stage reached.

APPENDIX V.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—(1) *Broach tract.*—The Indian Central Cotton Committee, at their meeting of January, 1934, finally decided in favour of the policy of growing *1027 A.L.F.* throughout the tract south of the River Narmada and also sanctioned a five-year scheme costing Rs. 65,000 for the multiplication and distribution of *1027 A.L.F.* seed in this tract. In pursuance of that policy, vigorous propaganda was carried out among cultivators to give up inferior cottons. These measures resulted in an increased demand for *1027 A.L.F.* seed and the Sonsek Co-operative Cotton Sale Society and other Societies took to the growing of *1027 A.L.F.* cotton.

During the year under report an area of 23,751 acres was maintained for seed multiplication purpose. Out of the 1,884,084 lb. of seed purchased last season, 1,506,255 lb. were supplied to British residents from 28 seed depots in the Surat tract and the remaining 377,830 lb. were supplied to Chhota Udepur and Baroda States. Besides, 428,734 lb. of seed were supplied direct by the Hansot Society Seed Group. The total seed distributed therefore amounted to 2,312,818 lb. This was a record figure inspite of the fact that Rajpipla State did not, as usual, purchase *1027 A.L.F.* seed from the Department and managed to meet their seed requirements from their own crop.

(2) *Khandesh tract.*—During the year *Banilla* cotton was grown in Khandesh on an area of about 130,000 acres representing about 12 per cent. of the total area under the cotton crop. The total production of *Banilla* cotton is estimated at 30,000 bales with an average of about 92 lb. of lint per acre. As a result of the Seed Expansion Scheme financed by the Indian Central Cotton Committee, Bombay, *Banilla* cotton has spread to a larger extent in the talukas of Amalner, Shirpur, Erandol, Pachora and Chalisgaon than in other talukas. The quality of cotton was generally satisfactory and pure *Banilla* cotton fetched a premium of Rs. 5 to Rs. 10 per *khandy* over the local cotton according to quality. The seed extension scheme financed by the Indian Central Cotton Committee, Bombay, reached its fourth year during 1934-35. An area of 15,983 acres was organised for the multiplication of pure pedigree seed and from this area, 1,900,000 lb. of seed was obtained.

(3) *The Deccan Canals tract.*—The total area under cotton on the Deccan Canals tract was 17,000 acres during the season and of this 5,000 acres were under *Banilla*. The Department is carrying on vigorous propaganda to introduce *Banilla* cotton in this tract as it yields better than the local *N.R.* mixture and fetches Rs. 5 to Rs. 10 more per *khandy* of 500 lb. of *kapas* than local cotton. A five year scheme costing Rs. 23.800 is being financed by the Indian Central Cotton Committee for the extension of this variety in the tract.

(4) *The Kumpta-Dharwar tract.*—The work of introducing two improved varieties of cotton, *viz., Jayawant* and *Gadag No. 1* was carried on an extensive scale through the Hubli and Gadag Cotton Sale Societies, with the aid of funds provided by the Indian Central Cotton Committee. The reserved area maintained for multiplying pure pedigree seed of *Jayawant* cotton at the Hubli centre was 21,000 acres and that of *Gadag 1* at the Gadag centre was 25,012 acres. The quantity of seed received by the Societies from these reserved areas was 1,602,832 lb. of *Jayawant* and 1,250,000 lb. of *Gadag-1* sufficient to cover 161,000 and 125,000 acres respectively, during the coming season.

For distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed-depots were opened as usual in different selected centres. The general area grown with pure seed was 126,286 acres under *Jayawant* cotton as against 106,708 acres of last year, and 65,238 acres under *Gadag 1* cotton as against 44,800 acres of last year. The estimated yield of *Jayawant* was 15,000 bales as against 17,500 bales of last year, and 4,600 bales of *Gadag No. 1* as against 5,600 bales of the previous year.

Besides, the Hubli Sale Society sent outside its area of operation 450,540 lb. of *Jayawant* seed enough for 45,050 acres. The total area under pure seed of *Jayawant* cotton was,

therefore, 191,336 acres as against 163,358 acres of last year. The Gadag Sale Society also distributed 122,497 lb. of *Gadag No. 1* seed enough for 12,250 acres outside its own area of operation. The total area under *Gadag No. 1*, therefore, came to about 102,500 acres.

With a view to spread *Jayawant* cotton in other areas, separate seed multiplication blocks of 4,594 acres at the Athani centre, 1,494 acres at Bailhongal and 445 acres at Bijapur were organised. With the funds from the Indian Central Cotton Committee, the area in the Athani centre fell on account of shortage of pedigree seed due to the damage caused to previous year's crop by very heavy floods in the Krishna river. 431,340 lb. of pedigree seed enough for 43,134 acres has been stocked for the coming season.

Both *Jayawant* and *Gadag No. 1* continued to be appreciated by the buyers who gave on an average Rs. 4 more per *Naga* of seed-cotton (1,344 lbs.) for *Jayawant*, and Rs. 12 per *Naga* for *Gadag No. 1* in auction sales.

SIND.—During the decade prior to the opening of the Lloyd Barrage canals, the annual area under cotton cultivation in Sind averaged slightly over 300,000 acres with an average outturn of approximately 100,000 bales. With the advent of Barrage canals, and the consequent early and assured water supply the area has increased to 703,290 acres (including Khairpur State) in the year 1934-35 with an approximate yield of 284,910 bales of cotton. The area under Sind American cotton was 193,803 acres in 1934-35 as against 146,000 acres in the preceding year. It has increased considerably during the current year 1935-36.

Three main classes of cotton.—Three main classes of cotton have been found to be successful in Sind, *viz.*, (*a*) Sind *deshi* (*b*) Sind American (*c*) Imported Egyptian.

Among each of these three main classes the Department of Agriculture in Sind has by botanical selection, evolved improved strains, which on account of better yield, high ginning outturn or superior quality are suitable for extension in general cultivation in the different cotton growing tracts of the Barrage areas.

Sind-American cotton.—This cotton occupied in 1934 about 193,803 acres out of the total area of 703,290 acres under cotton and was grown mostly in Thar Parkar district. During the current year the area under Sind-American cotton in Nawabshah district has considerably increased. *4F* cotton was at first the most popular variety grown in Sind but is now being replaced by other types, *viz. 289F*, *N.T.* and *K.T.* cottons. The improved strains now established by the Agricultural Department, seed of which is being multiplied on a large scale, are definitely superior to the parental stock and are quite distinct from the original material. These are :—

Sind-American 4F-98.—It has a staple length of $\frac{7}{8}$" to 15/16" and spins 34's. It has a ginning outturn of 33-34 per cent. and gives a high yield. This improved strain has been found to be the most suitable type for cultivation in the new cotton growing tracts being established on the Right Bank of the Indus.

Sind-American 289-F1.—This improved strain has a staple 1 1/16" long and spins 40's. It has a ginning percentage of 30 and in normal years is a very high yielder. This cotton is resistant to red leaf disease, jassid attack and can withstand seasonal variations of climate. This strain is particularly adapted for extension on the Left Bank of the Indus where the present cotton area is mostly located. This strain is the ' bread and butter ' of the cotton grower in Sind in the Barrage areas and may well be termed ' Sind *Sudhar* ' cotton, a name recently given to it.

The high premiums in price obtained for Sind-American cottons during the season 1934-35 have resulted in considerable increase of area under these cottons.

Imported Egyptian and Sea Island cottons.—Selected strains of these cottons acclimatised in Sind have been produced by the Sind Agricultural Department, *viz.*, (1) *Sea Island 2-4* (2) *Boss III-16* (Egyptian) have a staple length of $1\frac{1}{4}$" to $1\frac{1}{2}$" and are suitable for spinning 60-80's and (3) *Ashmouni 37* (Egyptian) has a staple length of $1\frac{1}{8}$" and is suitable

for spinning 50's. These improved strains have been tested on field scale and are found to grow well in Sind specially in East Sind. They are, however, peculiarly susceptible to white ant attack specially on virgin soils. The average yield was about 10 *maunds kapas* per acre in comparison with about 12 *maunds* obtained with Sind-American on good lands. The staple of these fine quality cottons is fine and strong. They require better cultivation than Sind-American or *deshi* cotton and should be grown on the best portion of the area to be put under cotton. During the year 1934-35 about 150 acres only were grown to these cottons but during the current season 1935-36 the area has increased to 2,400 acres.

Sind Deshi cotton.—This cotton has a special market of its own on account of its bright colour and rough feel being suitable for mixing with wool. It is very hardy and resists variations of soil, climate and season. It is capable of giving high yields and can be sown late *i.e.*, in the month of June. The improved Sind *deshi* strain *27 W.N.*, evolved by the Agricultural Department, gives an early and abundant crop (about 15-20 per cent. greater outturn than ordinary Sind *deshi* and a 4-5 per cent. higher ginning outturn *i.e.*, 38-39 per cent). This improved strain is now the standard *deshi* cotton in Sind. Trade opinion in Karachi considers that the total *deshi* crop which can be profitably consumed should not exceed 2,00,000 bales per annum. Any increase above this figure is likely to glut the limited market and result in reduced prices to the growers.

THE ECONOMIC SIDE.—The economic side of the question which is of primary importance to the grower depends largely upon the prices prevailing for the various types of cotton. During 1934-35 these cottons were sold in large quantities at the following rates :—

Variety.	Price of cotton lint.	
	Per *maund* of 82 lb.	Per *khandy* of 784 lb.
SIND-AMERICAN.—	Rs. a. p.	Rs. a. p.
4F-98	25 0 0	238 4 0
289F-1	27 0 0	257 5 0
SIND EGYPTIAN AND SEA ISLAND.—		
Sea Island 2-4	44 7 10	424 0 0
Boss III-16	44 7 10	424 0 0
Ashmouni 37	37 10 8	359 0 0
Sind *Deshi 27 W.N.*	15 8 0	147 11 5

The price of Broach cotton was Rs. 229 when Sind Egyptian and *Sea Island* cottons were sold at the above rates.

For successful cultivation of long stapled and fine quality cottons it is necessary to evolve a reliable marketing organisation which will secure adequate premium for quality from the trade. The Indian mills have of late shown considerable interest in these long stapled cottons and it is upto them to give an encouragement to the growers of these cottons for their future supply.

Extension and pure seed multiplication.—The pure seed extension scheme is based on 'Unit' system, each unit representing a final area of 25,000 acres under one improved variety. In this scheme which has now reached its fourth stage the programme adopted for multiplication and distribution of pure seed consists of five progressive stages, *viz.*, (1) Seed patch 2½ acres, (2) Increase block 25 acres, (3) Field scale plantings 250 acres,

(4) Village groups 2,500 acres, (5) District groups 25,000 acres. The first three stages are under departmental supervision. The last two stages are being arranged through selected growers and co-operative organisations. Ten such units have been started to supply seed to different cotton growing tracts. Thus 3 units have been fixed for *27 W.N.*, 1½ unit for improved Sind American *4F-98*, 4½ units for improved Sind American, *289F-1* (to be named 'Sind *Sudhar*' cotton), and one unit under high quality cottons.

The produce of the first three stages of the seed multiplication scheme was ginned under the supervision of the Agricultural Department and about 13,000 *maunds* of seed of improved strains evolved by the Agricultural Department were distributed for sowing in the current year 1935-36.

MADRAS.—I. *The Southerns tract.*—(A) *Cambodia—Coimbatore.*—(i) The multiplication of pure *Co. 2* cotton seed for distribution to cultivators continued as in previous years. The seed farms were continued by annual contract with co-operative seed societies as in the previous year. During the year, there were thus 854 acres (under annual contract) of seed farms with 3 societies consisting of 105 members at Tiruppur centre as compared to 954 acres with 3 societies of 148 members in the preceding year. This area is under the direct supervision of the Agricultural Department and named as "Inner Area". The selected seed out of this (Inner) area was supplied to the Tiruppur Co-operative Trading Society, Ltd., Tiruppur, for sowing their annual contract area. The Tiruppur Co-operative Trading Society had 5,152 acres with 21 societies in Avanashi and Palladam Taluks as against 4,164 acres with 7 societies in Avanashi Taluk during last year. Due to fodder scarcity the *royts* were obliged to reduce the area under cotton and increase the area under fodder and grain crops. Hence the Tiruppur Co-operative Trading Society could not run total contemplated area of 6,000 acres of *Co. 2* cotton under seed farm during the year. The total seed farm area in 1934-35 was thus 6,006 acres as against 5,118 acres in the previous year.

(ii) Pure *Co. 2* seed produced by the Agricultural Department and the Tiruppur Co-operative Trading Society including the natural spread is estimated to have covered 66,000 acres in 1934-35 season. In addition, 69,479 lb. of *Co. 2* seed sufficient for about 2,750 acres was supplied to other districts in the Presidency.

(iii) 1,769 *khandies* and 459 lb. of lint were obtained from 1933-34 seed farms and were sold at an average premium of Rs. 10 per *khandy* on the date of sale. The gradual reduction in premium is due to the high quality of lint that is being marketed owing to large distribution of pure *Co. 2* seed by the Department during the past few years.

(iv) During the coming season (1935-36) an area of 800 acres of *Co. 2* seed farms will be under the control of the Agricultural Department and about 6,000 acres under the control of the Tiruppur Co-operative Trading Society. Due to adverse weather conditions during 1934-35 season, the yield was about 50 per cent. less than normal. There will not therefore be much increase in the area under the improved strain in the coming season.

(v) *Cambodia—Trichinopoly.*—In the Trichinopoly District, 21,700 lb. of *Co. 2* Cambodia seed was distributed to the *ryots* by the Agricultural Department as compared to 8,097 lb. distributed in the previous year. This variety covered an area of about 1,450 acres during the year and it is estimated that the area during the coming season would be 2,314 acres in this district.

(vi) *Cambodia—Madura.*—The area under *Co. 2* seed farms was 176 acres as against 123 acres in the previous year. The quantity of seed distributed during the year from the seed farm was 68,635 lb. enough to cover an area of 4,575 acres as compared to 42,249 lb. for 2,816 acres in 1933-34. The area under this improved strain is now estimated to be 35,415 acres. Cambodia is a rainfed crop and in the *Masipattam* sowings (March-April) in the single crop paddy area is getting to be more and more popular.

(B) *Karunganni—Coimbatore.*—The multiplication of *C. 7 Karunganni* strain of the Tinnevelly tract which has become popular in Coimbatore with a corresponding reduction in the *Uppam* area was continued. The propagation of this strain through seed farms similar to those for Cambodia was continued. During the year under report, there were

745 acres of seed farm at Udamalpet (Annual contract) with 20 *ryots* as compared to 809.87 acres of seed farm with 18 *ryots* in the preceding year. 98,717 lb. of *C. 7 Karunganni* cotton seed were distributed to the cultivators in the year. It is estimated that this strain will occupy an area of about 15,000 acres. The yield of lint from 1933-34 seed farms was 100 *khandies* 11 lb. The seed farm lint commanded a premium of Rs. 4-2-0 per *khandy* of 500 lb. in the market on the date of sale.

Karunganni—South.—The area under *Karunganni* strains *C. 7* and *A. 10* seed farms was 1,330 acres as against 1,202 acres of the previous year. Strain *C. 7* is popular in the Tinnevelly district while *A. 10* is in great demand in the Madura and the Western Taluks of the Ramnad district. The quantity of seed distributed from seed farms in 1934-35 was 133,785 lb. sufficient for an area of 11,149 acres as compared to 118,800 lb. sufficient for 9,900 acres distributed in 1933-34. The area under these strains covered by natural spread is estimated to be 117,748 acres. It is proposed gradually to replace this strain by another promising strain Koilpatti *No. 1* (*Karunganni*). Seed of the new strain for growing nearly 500 acres in the coming season has been obtained.

II. *Northerns and Westerns tract.*—A. *Northerns.*—On account of the very limited area where *N. 14* can be grown profitably, no seed farms were maintained and the total quantity of seed sold was 750 lb. as compared with 9,933 lb. in the previous year. It is estimated that this strain was cultivated on an area of about 2,500 acres only as compared with 3,194 acres in the previous year. It is estimated that, on account of an exceptionally good season, an average yield of 350 lb. *kapas* per acre was obtained, as against about 70 lb. per acre in the previous year. The premium paid by Messrs. Binny and Co. was Rs. 10 to Rs. 15 per *khandy* (500 lb.).

B. *Westerns.*—The area of seed farms maintained and sown to *H. 1* was 3,588 acres as compared with 2,895 acres in the previous year. 291,233 lb. of *H. 1* seed were distributed in 1934-35 as compared with 223,300 lb. in the previous year.

The area sown to *H. 1* is estimated to be about 204,000 acres, as compared with 200,379 acres in the previous year. The average yield was about 129 lb. of *kapas* per acre as compared with 200 lb. in the previous year. The low yield was due to the exceptionally unfavourable season. The local mixed cotton gave an average yield of about 75 lb. *kapas* per acre as against 150 lb. in the previous year.

By means of co-operative marketing, 600 bales of *H. 1* lint was sold by *ryots* assisted by this Department and the premium realised ranged from Rs. 3-8 to Rs. 5 per bale of 400 lb. The fall in the premium is due to the poor quality of lint caused by low rainfall.

Central Provinces and Berar.—The recognition during the year of the two new cottons, *V. 434* and *Late Verum*, as standard Indian cottons marked a further step in advance in the work of cotton improvement in these provinces. The chief feature of the year was the success which attended the cultivation of *V. 434*. Grown under a wide range of condition this cotton proved to be the best all-round type available at present—hardy, prolific and superior in lint. At the Government Experimental Farm, Akola, an average yield of 635 lb. per acre was recorded, which was 48 per cent higher than the annual average outturn of Farm for the past 25 years. Similar reports were received regarding its behaviour and cropping power from other places where it was tried. It showed remarkable adaptability to variations in climatic conditions which were so marked a feature of the past year, gave good outturn of superior quality lint and thus proved its superiority over all other strains known at present. In spinning capacity, it actually showed an improvement over the past season. A representative sample of it sent to the Technological Laboratory, Matunga, Bombay, was very well reported upon and adjudged suitable for spinning 37's standard warp counts—a great advance over the 8's of *Roseum* and 20's of *Verum 262*. During the past two years this cotton has secured an average premium of Rs. 10 over the *Late Verum* or Rs. 20 over *Verum 262*. The area under it in the past season was estimated to be 2,000 acres which should ensure about 20,000 acres in the coming season if all the seed gets sown.

There is no doubt that in future success in cotton growing in these provinces would be in medium staple cottons or types that would spin higher counts than 20's. Realising that the demand for coarse cottons in the near future may become still smaller, the

Agricultural Department in collaboration with the Indian Central Cotton Committee has launched a five years' scheme for increasing the proportion of finer varieties that can compete in the world market.

The total area under *Verum* cottons during the past season was 107,200 acres compared with 89,000 acres in the preceding year.

United Provinces.—C. 520. This cotton is spreading rapidly and reached 14,431 acres during the year under report.

A-19 seed sufficient to cover an area of 28,383 acres was distributed during the year from departmental and private agencies.

C. 402.—Owing to unfavourable weather conditions in the season 1933-34 the cotton area sown in the Sarda Canal suffered and the produce obtained was very poor. The prices realised, however, for such cotton lint as there was was 30 to 40 over Broach and the Bilgram Cotton Purchase and Sale Society on an investment of about Rs. 17,000 made a profit of Rs. 11,000. A premium of Rs. 1-8-0 per *maund* was paid to the cotton growers selling through the Society. This however scarcely compensated for the very low yield got from this cotton. The area under this cotton in the Sarda Circle in the year under report was 2,746 acres.

Punjab.—The total area under American cotton in British Districts was 840,700 acres as compared with 809,120 acres in the preceding year. Of this *4-F* was grown on 769,700 acres and *289-F* was reported to have been grown on 56,000 acres.

2. The total area under *desi* cottons in the province (excluding Indian States) was 1,506,300 acres against 1,640,300 acres in the last year. *Mollisoni*—a selection of the *Indicum* variety—was grown on 727,200 acres whilst a type of improved *Roseum* covered an area of about 52,000 acres.

3. As a result of Research carried out in recent years at Lyallpur under a scheme financed jointly by the Punjab Government and the Indian Central Cotton Committee several new strains of cotton, both *desi* and Punjab-American, have been evolved. Some of these new cottons are destined to take an important place in the cotton crop of the province.

Amongst *desi* cottons the most important selection produced so far is *15 Mollisoni*. This cotton, selected some years ago for its uniformly good yield, is now the chief commercial *desi* cotton of the Canal Colonies.

Amongst the new Punjab-American cottons is the variety known as *43-F*. This variety is a very distinct improvement over *4F.*, the present day commercial variety of Punjab-American cotton, in several respects such as (1) early maturity, (2) resistance to the attack of jassids (Tela), (3) length of staple (average length $1\frac{1}{32}$ inch. against 25/32 inch in the case of *4-F*), (4) high spinning counts (35's for *43-F* and 21's for *4-F*) and (5) high yield.

BURMA.—(1) *Myingyan Circle.*—The total area under improved departmental cotton was 3,769 acres all of which was put down to the re-selected *C/19* strain. The resulting crop gave an average outturn of 38 per cent. while the ordinary Wagale crop gave only 32 per cent. The total quantity of *kapas* of the improved strain ginned at the Mahlaing Central Farm ginnery was 127,305 *viss* (124,186) and 75,368 *viss* (73,338) of *C/ 19* seed are available for distribution.

At the Mahlaing Central Farm the improved *C/19* white flowered strain was again yield tested against three hybrid strains, *viz., L11* × *W6*, *C/19* × *W5* and (*S* × *W*) × *W3*, one mixture of pure strains, and the original Pwinbyu. Results tended to confirm those of previous years showing *L11* × *W6* to be very superior in yield and *C/19* × *W5* slightly so over *C/19*. Also the Master Spinner of the Myingyan Spinning Mill reported highly on the two strains, especially *L11* × *W6* corroborating the report of the Technological

Laboratory, Bombay, in the previous year. Consequently these two strains are being tried out in the districts and multiplied. The report of the Technological Laboratory is repeated for information.

Cotton.	Staple length inch.	Highest standard warp counts.	Value above or below contract rate for Broach Extra Superfine @ Rs. 182.
C/19	½″	10	Rs. 20 off.
C/19 × W5 ..	11/16″	13	Rs. 15 off.
L11 × *W6*	¾″	20	Rs. 10 off.

West Central Circle.—In the West Central Circle this crop is of importance only in Thayetmyo District where it is grown as a mixed crop with sesamum or with Taung-ya paddy. Its area there was 55,383 acres. Experimental work on cotton was confined to Allanmyo where several hybrids and pure lines were tested.

Distribution of the seed of three improved Wagale strains was made in Thayetmyo, Minbu and Pakokku Districts. It is reported that the yields in all the places were satisfactory.

Rajpipla State.—The Rajpipla State has continued its policy of maintaining the improved strain (*1027 A.L.F.*) as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution of selected seed obtained by special arrangements for the purpose, (2) by the Cotton Transport Act which prohibits and penalizes the sowing or importing into the State for purposes of sowing *Goghari* cotton seed or any other short staple seed and (3) by the control of ginning and pressing factories for the prohibition and prevention of admixture of short staple varieties with the pure *1027 A.L.F.* crop of the State.

As the cotton crop of the Surat District wherefrom the supply of the seed of *1027 A.L.F.* was usually obtained had suffered to a very great extent from severe frost during the season of 1934 and as an appreciable portion of the local crop was already gathered before damage was caused by frost in Gujerat, the best seed of *1027 A.L.F.* was secured by careful selection from such local crop gathered prior to the advent of frost. The liberal policy of distributing the seed thus obtained by way of *Tacavi* to the cultivators of the State from different convenient depots was continued as usual and this tended to maintain the quality and outturn to all that could be desired.

One great advantage to the cultivators by the introduction of *1027 A.L.F.* variety of cotton for cultivation in the State is that whereas in the past when the short staple *Goghari* cotton was cultivated here in the State they were required to go some forty to fifty miles and at times still further away from their houses into British Districts to sell their cotton ; now through the introduction of this measure and the success it has achieved they have found a ready market at their own doors and there is such a demand for it that even in these years of heavy depression, this cotton is readily sold at comparatively good prices.

Besides, this measure has stimulated the growth of meetings for the sale of the cotton crop to the highest customer at various agricultural centres in the State ; and this has resulted in cultivating a spirit of combination in the cultivators to dispose of their agricultural produce at the best prices available.

Rajpipla cotton (known by the term Jagadia cotton in the market) is now recognised as equal to the very best cotton and is largely sought after. A notable feature of the crop for the year was that even though the seed was selected from the local crop of *1027 A.L.F.* variety it had so nicely suited the soil and the crop therefrom was observed to be so highly flourishing that had it not been for the advent of frost early during the onset of the season,

the State would have been able to put forth a record output of crop for the year. Despite the most destructive character of the frost in extensive areas under cotton cultivation, the State was able to put forth nearly two thirds of its ordinary output of cotton in the market; it is also noted with gratification that the quality of this State cotton crop maintained its high standard of superiority over short staple varieties and this was evident from the fact that it commanded a very high percentage of extra price in the market. The success achieved from this experiment of cotton cultivation from the best selected seed of *1027 A.L.F.* variety of local crop has considerably facilitated the work of the revenue authorities who have now a much wider field of selection of the best seed of this variety than they have had hithertofore.

BARODA STATE.—(1) *Navsari District.*—The important item during the year consisted in the extension of *1027 A.L.F* type and eradication of inferior types of cotton like *Goghari.* Owing to the severe damage to cotton on account of frost in the middle of January, arrangements for large quantities of good cotton seed had to be made and eventually 955,580 lbs. of cotton seed was distributed through 12 seed depots. Seven of these were financed from the grant of the Indian Central Cotton Committee and the rest by the Baroda Government.

As no pedigree seed of *1027 A.L.F.* was available from the Bombay Department, seed separately ginned under Departmental supervision, from the registered growers was distributed to 435 registered seed growers in 4 groups and this is expected to cover about 5,000 acres.

(2) *Baroda District.*—The only extension work in the district is that of the Broach 9 cotton. During the year, the seed distribution from various sources was estimated to cover an area of about 8,000 acres excluding Dabhoi Taluka, which is known to grow a good deal of Broach 9 on a considerable scale, but owing to damage by frost no further organised work could be done.

(3) *Mehsana District.*—Attempts are being made to introduce *Wagad No. 8* in place of local *Wagad.* 2,100 lb. of *Wagad 8* pure cotton seed was supplied to the cultivators but severe frost has interfered in getting any results.

(4) *Amreli District.*—Dhulia No. 1 is being recommended for this part and 57,930 lb. of seed cotton was supplied to the cultivators covering about 3,500 acres by the Amreli Pedhi and Cotton Seed Supply Association.

HYDERABAD STATE.—1. *Gaorani Tract.*—Distribution of *Gaorani* seed in the protected area was continued. 1,169,338 lb. of seed for an area of about 73,090 acres was purchased by the Agricultural Department and distributed on *Tacavi* loan system to cultivators in the Nanded district.

A beginning has been made with multiplication of seed of two recently evolved superior strains of *Gaorani,* for distribution in the next year.

2. *Aurangabad District.*—Distribution of *Banilla* seed was continued, with a view to replace the inferior mixture now grown in the district. 143,040 lb. of seed sufficient for about 9,000 acres was distributed by the Agricultural Department on *Tacavi* system.

3. *Parbhani District.*—Distribution of seed of *Verum* 262 was continued, with the object of replacing the present inferior variety. 18,296 lb. of seed sufficient for about 1,550 acres was distributed by the Agricultural Department.

4. *Raichur District.*—Distribution of seed of improved varieties was continued, with a view to replace the local inferior type of *Kumpta* and the mixed Dharwar-American. Seed of *Jayawant* variety amounting to 295,508 lb. sufficient for about 29,551 acres and seed of *Upland Gadag No. I* amounting to 34,710 lb. for about 3,471 acres was distributed this year.

APPENDIX VI.

BALANCE SHEET AS AT 31ST MARCH 1935.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		98,42,117 6 7	I. A. Administration		15,51,290 8 3
Interest Account—			B. *Improvement of Cotton Marketing*—		
Amount received on investments	14,78,471 8 7		1. Cost of exhibits, moisture tests, etc...	78,161 11 8	
Add—Refund of income-tax deducted from interest	18,072 13 0		2. Cost of growing cotton in India ..	1,29,676 0 0	
	14,96,544 5 7				2,07,837 11 8
Less—			C. *Seed Distribution and Extension Schemes*—		
1. Interest paid in advance at the time of purchasing Government Paper (since recovered) interest on temporary overdraft and Bank's commission for collection of interest	44,124 14 1		I. *Bombay* :—		
			1. Hubli	32,445 7 3	
			2. Gadag	33,026 10 9	
			3. Gadag Supplementary	20,188 10 6	
			4. Surat	35,243 3 1	
			5. Athani	11,786 6 11	
			6. Khandesh	1,19,371 12 5	
			7. Deccan Canals (Banilla)	3,505 10 3	
2. Interest credited to Provident Fund account	4,886 6 2		II. *Madras* :—		
			1. Pay and allowances of Business Manager, Tiruppur	13,026 15 0	
			2. Co. 2	15,132 12 4	
			3. H1	3,952 2 9	
3. Bank's withdrawal charges for securities sold	2,491 1 0		III. Sind	1,33,913 12 11	
4. Income-tax on interest	20,158 3 6		IV. Hyderabad	23,954 12 1	
5. Brokerage for sterling loan sold	291 9 0		V. *Central Provinces* :—		
6. Provision for Sinking Fund	5,848 2 0		1. Verum cotton	73,544 2 5	
		14,18,744 1 10	2. Long staple	30,235 0 0	
	77,800 3 9		VI. Baroda	3,117 4 0	
Profit on conversion and sale of securities ..		53,671 12 7	VII. Lyallpur Ginnery	16,038 3 3	
Sinking Fund account		5,848 2 0			5,68,482 13 11
Miscellaneous Receipts		30,833 11 10	D. *Printing and Propaganda*—		
Refund from provident fund for contributions disallowed		3,391 1 11	1. Publicity and Propaganda ..	62,735 2 9	
Suspense Receipts		1 0 0	2. Printing and Distribution ..	32,440 7 3	
					95,175 10 0
Carried over ..		1,13,54,607 4 9	Carried over ..		24,22,786 11 10

BALANCE SHEET AS AT 31st MARCH 1935—*contd.*

Receipts.	Rs. a. p.	Expenditure.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,13,54,607 4 9	Brought forward ..		24,22,786 11 10
		E. *Statistical Research*—		
		1. Studies of village consumption of cotton	22,005 7 6	
		2. Forecast Improvement Scheme	3,897 0 0	
				25,902 7 6
		II. *Technological Research*—		
		1. *Technological Laboratory*—		
		A. Capital Expenditure—		
		1. Land and Buildings	3,82,741 10 3	
		2. Machinery	86,336 1 8	
		3. Freight	7,502 2 8	
		4. Apparatus and Equipment	41,558 3 7	
		5. Machinery Workshop	5,789 8 3	
		B. Working Expenses	15,10,536 5 9	
		2. Provincial	63,397 3 3	
				20,97,861 3 5
		III. Research Studentships		2,39,822 5 7
		Agricultural Research Grants.		
		IV. *Bombay*:—		
		1. A. Surat Physiological	2,45,139 11 3	
		B. ,, ,, Writing-up	5,814 7 8	
		2. A. ,, Boll-worm	1,14,509 9 7	
		B. ,, Boll-worm Propaganda	91,468 9 2	
		C. ,, ,, Writing-up	2,315 3 0	
		3. A. Dharwar Wilt	1,82,836 4 11	
		B. ,, ,, Writing-up	10,902 10 3	
		4. Khandesh Cotton Breeding	26,573 5 0	
		5. Co-ordination of Cotton Research	1,749 7 6	
		6. Jalgaon Cotton Breeding	20,251 5 3	
		7. Broach Cotton Breeding	25,066 13 7	
		8. Small Leaf Disease Survey	4,037 2 0	
		9. Survey of Goghari cotton in Bombay Presidency ..	510 0 0	
		10. Defibration of cotton seed in Bombay Presidency ..	3,450 0 0	
		V. *Madras*—		
		(*a*) Herbaceum	1,12,097 5 8	
		(*b*) Pempheres and Physiological	64,671 12 5	
		(*c*) Fodder Cholam	10,355 5 4	
		(*d*) Nadam Cotton Breeding	4,589 6 8	
Carried over	1,13,54,607 4 9	Carried over ..	9,26,338 7 8	47,86,372 12 4

BALANCE SHEET AS AT 31st MARCH 1935—*concld.*

Receipts.	Rs. a. p.	Expenditure.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,13,54,607 4 9	Brought forward ..	9,26,338 7 3	47,86,372 12 4
		VI. *Punjab*—		
		(*a*) Botanical	4,37,968 0 7	
		(*b*) Entomological	1,56,441 13 4	
		(*c*) White Fly	38,149 5 0	
		(*d*) Root Rot	10,578 3 9	
		(*e*) Spraying Trials	10,812 11 3	
		(*f*) Defibrating and Delinting	7,700 0 0	
		(*g*) Physiological	1,919 8 0	
		(*h*) Survey of Disease of Malformation	1,911 0 0	
		VII. *Central Provinces*—		
		(*a*) Botanical	3,44,737 12 6	
		(*b*) Entomological	2,220 0 0	
		VIII. *United Provinces*—		
		(*a*) Pink Boll-worm	1,47,834 1 4	
		(*b*) Rohilkhand and Bundelkhand Cotton Survey ..	9,732 10 0	
		IX. Institute of Plant Industry, Indore	13,36,343 12 0	
		X. Sind	1,85,095 0 5	
		XI. *Burma*—		
		(*a*) Capital	2,906 15 5	
		(*b*) Cotton Improvement	28,242 7 9	
		XII. *Hyderabad*—		
		(*a*) Botanical	1,58,328 14 4	
		(*b*) Cotton Survey	25,815 10 3	
		(*c*) Pink and Spotted Boll-worm	14,174 15 1	
		XIII. Bikaner	31,489 6 9	
		XIV. *Baroda*—		
		(*a*) Root Rot	31,827 15 11	
		(*b*) Comparative Tests	4,251 5 3	
		(*c*) Survey of Goghari Cotton	505 0 0	
		XV. Bengal-Comilla	889 0 0	
				39,16,214 0 2
		XVI. *Loans recoverable* (but considered doubtful) :—		
		(1) Co-operative Cotton Sale Society, Hubli	7,628 12 8	
		(2) Co-operative Cotton Sale Society, Gadag	7,292 0 0	
				14,920 12 8
		Suspense account		1,665 1 10
		By Balance		26,35,434 9 9
Total	1,13,54,607 4 9	Total ..		1,13,54,607 4 9

BALANCE SHEET AS AT 31ST MARCH 1935.

Provident Fund Account.

RECEIPTS.	Rs.	a.	p.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.	Rs.	a.	p.
Subscribers' contributions ..	1,62,565	5	4				By Advances to subscribers ..	31,911	3	0			
Less—Payments made to subscribers resigned	40,189	13	3				*Less*—Recoveries made upto 31st March 1935	27,696	12	0			
				1,22,375	8	1					4,214	7	0
Committee's contributions ..	1,59,010	11	7										
Less—Payments made to subscribers resigned and forfeitures to the Committee and to the Lapses and Forfeitures account.	38,002	1	8				Accrued interest on Government Paper credited to subscribers' account				2,209	4	0
				1,21,008	9	11							
Suspense Deposit of Mr. Dutt's own contributions with interest	1,006	3	3				By Balance				2,64,489	10	7
Suspense Receipts (Provident Fund amount of Mr. Aziz Ahmed	224	7	6										
				1,230	10	9							
Investment Fluctuation account. .				25,719	4	5							
Lapses and Forfeitures account ..				579	4	5							
Total ..				2,70,913	5	7	Total ..				2,70,913	5	7

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH 1935.

RECEIPTS.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
†Opening Balance	27,49,659 14 7	Administration of the Committee, (including Improvement of Cotton Marketing, Seed Distribution and Extension, Printing and Propaganda and Statistical Research)	....	4,02,392 12 5
Receipts under Section 12 of the Indian Cotton Cess Act, 1923	7,33,553 14 1	Agricultural Research Grants-in-Aid	....	4,00,760 13 6
‡Other Receipts	8,487 1 8	Technological Research	....	1,68,469 1 9
Interest on Investments	1,31,942 5 7	Closing Balance (Government Paper at cost) :—		
		3½% Government Promissory Notes of the face value of .. Rs. 7,06,300	4,43,583 2 5	
†Includes Rs. 4,723-7-0 on account of Sinking Fund and Rs. 15,355-9-3 against loans recoverable from Hubli and Gadag Co-operative Cotton Sale Societies.		3½% Government of India Loan 1947-50 of the face value of ,, 2,75,000	2,18,032 13 0	
		*4% Government of India Loan 1960-70 of the face value of ,, 10,01,900	9,06,285 8 10	
		4½% Government of India Loan 1955-60 of the face value of ,, 26,600	25,004 0 0	
‡Includes Rs. 1,119-11-0 against provision for Sinking Fund for the year 1934-35.		5% Government of India Loan 1939-44 of the face value of ,, 2,09,000	1,88,664 3 6	
		6% Bombay Municipal Bonds 1954 of the face value of ,, 50,000	56,500 0 0	
		6% Karachi Port Trust Coupon Debentures 1955 of the Face value of ,, 1,30,000	1,41,212 8 0	
		6% Rangoon Municipal Debentures 1956 of the face value of ,, 3,83,500	4,15,328 2 0	
		3½% India Sterling Bearer Bonds of the face value of .. £ 20,000	2,20,688 14 10	
		(Market value on 31st March 1935 Rs. 31,38,201-5-6)	26,15,299 4 7	
		Imperial Bank of India Current Account	15,799 10 9	
		Imprest—Committee's Accounts as certified by the Secretary Rs. 1,500 0 0		
		Technological Laboratory, as certified by the Director, Technological Laboratory .. 500 0 0		
		High Commissioner for India, London, for scholarship (£100) .. 1,335 10 5	3,335 10 5	
		Deposit with Application for 10 Reserve Bank Shares	1,000 0 0	
		Suspense (Recoverable)	1,665 1 10	
		Loans Recoverable (but considered doubtful)	14,920 12 8	
		**Total Closing Balance		26,52,020 8 3
Total ..	36,23,643 3 11	Total ..		36,23,643 3 11

*4% Government of India Loan 1960-70 of the Face Value of Rs. 1,16,900 has been deposited with the Imperial Bank of India for security against any overdraft that may be required by the Committee.

**This includes Rs. 5,848-2-0 on account of Provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required and Certify that to the best of our information and explanations received the above Statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, *30th April* 1935.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

PROVIDENT FUND ACCOUNT AS AT 31ST MARCH 1935.

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1934 ..	2,32,951 12 10		By Balance :—		
Rs. a. p.			Securities in Government Paper at Market Price).		
Subscribers' Contributions .. 17,490 14 0			3½% Government Promissory Notes of the face value of Rs. 85,600	76,612 0 0	
Add—Recoveries against advances . 4,318 12 0			3½% Government of India Loan 1947-50 of the face value of ,, 37,000	37,370 0 0	
	21,809 10 0		4% Government of India Loan 1960-70 of the face value of ,, 32,600	33,741 0 0	
	2,54,761 6 10		5% Government of India Loan 1939-44 of the face value of ,, 25,600	27,456 0 0	
Less—Refunds to Subscribers who have resigned 5,899 12 7			6½% Bombay Improvement Trust Loan 1937 of the face value of .. .. .. ,, 17,500	18,681 4 0	
Advances to Subscribers 6,873 0 0			Savings Bank Deposit with the Imperial Bank of India	47,247 14 1	
	12,772 12 7		Savings Bank Account with the Imperial Bank of India	5,618 4 0	
	2,41,988 10 3		Current Account with the Imperial Bank of India	17,763 4 6	
Committee's Contribution received from Indian Central Cotton Committee at 100 per cent ..	17,490 14 0				
	2,59,479 8 3				
Less—Payments to Subscribers who have resigned including transfers to Lapses and Forfeitures Account for contributions disallowed	5,781 15 9				
		2,53,697 8 6	*Total Closing Balance		2,64,489 10 7
Interest received on Investments	8,833 12 3				
Interest received on Advances to Subscribers ..	189 8 7				
Refund of Income-Tax deducted on Interest received during 1933-34	105 5 0				
	9,128 9 10				
Less—Interest paid during the year to subscribers who have resigned :—					
Rs. a. p.					
On their own contributions .. 151 14 8			*Includes Rs. 1,006-3-3 being Suspense Deposit with interest thereon of Mr. Dutt's own contribution.		
On Committee's contributions . 157 14 8					
Interest paid in advance at the time of purchase of Government Paper (since received) 281 4 3					
Income-Tax deducted from interest on Investments (recoverable) 14 11 7					
Bank's Commission for collection of interest and cost of stamps.. 23 0 5					
	628 13 7				
		8,499 12 3			
Lapses and Forfeitures Account		333 3 4			
Investment Fluctuation Account		1,734 11 0			
Suspense Account of Mr. Aziz Ahmed (deceased).		224 7 6			
Total ..		2,64,489 10 7	Total ..		2,64,489 10 7

Examined and found correct.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

BOMBAY, 30*th April* 1935.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31st, 1935.

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure up to 31st March 1935.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and buildings.	(*b*) Machinery, apparatus and other moveable property.-			
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.	Yrs. Mths.		RESEARCH SCHEMES. Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
II. *Technological Research.*—									
(1) Technological Laboratory.—									
(*a*) Capital Expenditure .	5,71,399 3 8	Permanent.	1923	5,23,927 10 5	3,82,741 10 8	1,39,869 4 7	....	....	*Physiological Scheme closed down on 4th August 1932 and Writing-up Scheme closed down on 17th October 1933.
(*b*) Working Expenses ..	15,32,169 15 7		Jan. 1924	15,10,536 5 9	....	1,816 11 7	41,313 12 1	14,69,222 9 8	
(2) Provincial	63,397 3 3		April 1928.	63,397 3 3	....	....	3,386 9 0	60,010 10 3	
AGRICULTURAL RESEARCH GRANTS.									
IV. *Bombay Schemes.*—									
(1) Surat Physiological and Writing-up*	2,91,445 0 0	10 1½	Sept. 1923	2,50,954 2 11	....	....	23,334 5 2	2,27,619 13 9	
(2) (*a*) Surat Boll-worm ..	1,20,720 0 0	7 7	Do.	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	Scheme closed down on 31st March 1931.
(*b*) ,, ,, Writing-up	2,420 0 0	0 4	July 1932	2,315 3 0	....	....	....	2,315 3 0	
(*c*) ,, ,, Propaganda and Clean-up ..	1,28,764 0 0	6 0	April 1931	91,468 9 2	....	....	10,828 0 11	80,640 8 3	
(3) Dharwar.—									
(*a*) Wilt & Cotton Breeding	2,63,545 0 0	8 11	Sept. 1923	1,82,836 4 11	....	....	13,718 3 7	1,69,123 1 4	Scheme closed down on 31st July 1932 and in July 1929.
(*b*) Writing-up	11,355 0 0	0 10	June 1932	10,902 10 3	....	....	....	10,902 10 3	Scheme closed down on 31st March 1933.
(4) Khandesh Cotton Breeding	27,995 0 0	5 6	Oct. 1926	26,573 5 0	....	....	....	26,573 5 0	Scheme closed down on 31st March 1932.
(5) Broach Cotton Breeding ..	65,000 0 0	5 7½ 0	April 1932	25,066 13 7	....	....	2,658 1 0	22,408 12 7	
(6) Jalgaon Cotton Breeding .	41,111 0 0	5 0	Do.	20,251 5 3	....	....	751 0 3	19,500 5 0	
(7) Co-ordination of Cotton Research	23,991 0 0	....	Not to start	1,749 7 6	....	....	....	1,749 7 6	
(8) Survey of Small Leaf—Disease of cotton ..	5,298 0 0	1 0	Nov. 1933	4,037 2 0	....	....	495 2 6	3,541 15 6	
(9) Survey of Goghari Cotton in Bombay Presidency	5,000 0 0	5 0	Jan. 1935	510 0 0	....	....	....	510 0 0	
(10) Defibration of Cotton seed in Bombay Presidency :—									
Recurring	5,250 0 0	3 0	Not started.	3,450 0 0	....	3,450 0 0	....	....	
Non-recurring ..	3,700 0 0								

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure up to 31st March 1935.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.* staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and buildings.	(*b*) Machinery, apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.	Yrs. Mths.		RESEARCH SCHEMES—(*contd.*) Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
V. *Madras Schemes.*—									
(1) Herbaceum..	1,47,068 0 0	14 6	Dec. 1923	1,12,097 5 8	....	....	4,420 10 3	1,07,676 11 5	
(2) Pempheres and Physiological	2,12,779 0 0	7 0	Sept. 1931	64,671 12 5	....	....	6,234 11 10	58,437 0 7	
(3) Fodder Cholam—									
(*a*) Capital	900 0 0	5 5	Jan. 1931	10,355 5 4	....	881 11 7	....	....	
(*b*) Recurring	16,800 0 0				....	....	270 1 11	9,203 7 10	
(4) Nadam Cotton Breeding ..	13,730 0 0	5 0	June 1933	4,589 6 8	....	....	388 14 0	4,200 8 8	
VI. *Punjab Schemes*—									
(1) Botanical—									
(*a*) Capital Expenditure .	31,330 0 0	14 8	Aug. 1925	4,37,968 0 7	22,158 0 0	9,102 11 0	....	....	†Rs. 2,030 transferred to Capital from Working grant.
(*b*) Working Expenses ..	†6,85,650 0 0				....	....	31,484 2 4	3,75,223 3 3	
(2) Entomological—									
(*a*) Capital Expenditure .	6,000 0 0	10 11	May 1926	1,56,441 13 4	....	5,826 3 10	....	....	
(*b*) Working Expenses (Pink and Spotted Boll-worm) ..	2,40,410 0 0				....	....	8,985 1 0	1,41,630 8 6	
(3) White Fly	56,087 0 0	4 11	May 1931	38,149 5 0	....	....	9,245 15 6	28,903 5 6	
(4) Root-Rot	42,206 0 0	6 0	Sept. 1932	10,578 3 9	....	....	91 14 6	10,486 5 3	
(5) Spraying Trials	14,400 0 0	2 0	July 1933	10,812 11 3	....	....	3,028 5 3	7,784 6 0	
(6) Physiological	1,48,833 0 0	5 0	March 1935	1,919 8 0	....	....	....	1,919 8 0	
(7) Defibration and Delinting Plants.—									
(*a*) Recurring ..	1,000 0 0	....	....	1,000 0 0	....	....	....	1,000 0 0	
(*b*) Non-recurring ..	6,700 0 0	....	....	6,700 0 0	....	‡5,872 10 0	....	....	‡Rs. 827-6-0 since refunded.
(8) Survey of disease of malformation	2,674 0 0	1 0	June 1934	1,911 0 0	....	....	....	§ 1,911 0 0	§Rs. 180-5-6 since refunded.
VII. *Central Provinces*—									
(1) Botanical	††61,000 0 0	2 6	Oct. 1923	3,44,737 12 6	....	....	4,605 12 10	3,40,131 15 8	††The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
	5,86,150 0 0	13 0	April 1926						
(2) Entomological	6,773 0 0	2 0	July 1934	2,220 0 0	....	....	84 2 0	2,135 14 0	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO MARCH 31ST, 1935.—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure up to 31st March 1935.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and buildings.	(*b*) Machinery, apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.	Yrs. Mths.		RESEARCH SCHEMES—(*concld.*) Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
VIII. *United Provinces*—									
(1) Pink Boll-worm Scheme—									
(*a*) Capital Expenditure .	54,000 0 0	8 0	July 1923(*a*)	1,47,834 1 4	....	47,983 12 9	....	96,785 0 4	(*a*) Scheme closed down on 31st July 1931.
(*b*) Working Expenses ..	56,000 0 0				....	....	3,065 4 8		
(*c*) Recurring grant for staff	44,475 0 0	7 9¼	Oct. 1926(*b*)		....	....	....		(*b*) Scheme closed down on 12th July 1934.
(2) Rohilkhand and Bundelkhand Cotton Survey ..	15,800 0 0	3 0	July 1933	9,732 10 0	....	....	1,253 3 1	8,479 6 11	
IX. *Institute of Plant Industry, Indore.*—									
(*a*) Capital Expenditure .	(*c*)2,33,535 12 10	Permanent	Oct. 1924	13,36,343 12 0	2,12,552 11 5	70,983 1 5	....	....	(*c*) Rs. 50,202-12-10 transferred from Recurring grant to Capital.
(*b*) Working Expenses ..	10,52,807 15 2				....	....	31,857 4 4	10,20,950 10 10	
X. *Sind*	2,74,346 0 0	9 9	July 1927	1,85,095 0 5	....	....	18,537 5 6	1,66,557 10 11	
XI. *Burma*—									
(*a*) Capital Expenditure .	3,000 0 0	....	....	2,906 15 5	....	2,906 15 5	....	....	
(*b*) Cotton Improvement .	49,032 0 0	6 0	April 1931	28,242 7 9	....	....	3,970 6 0	24,272 1 9	
XII. *Hyderabad*—									
(*a*) Botanical	3,59,617 0 0	9 11	May 1929	1,58,328 14 4	....	....	6,463 9 2†	1,51,865 5 2	†Figures subject to revision on receipt of Annual Return for 1934-35.
(*b*) Cotton Survey ..	39,165 0 0	4 10	June 1931	25,815 10 3	....	....	149 6 7†	25,666 3 8	
(*c*) Pink and Spotted Boll-worm	42,490 0 0	3 0	June 1933	14,174 15 1	....	....	123 12 11†	14,051 2 2	
XIII. *Bikaner*—									
(*a*) Capital Expenditure .	14,500 0 0	5 0	Jan. 1931	31,489 6 9	8,584 6 9	3,735 1 9	....	....	
(*b*) Working Expenses ..	38,200 0 0				....	....	....	19,169 14 3	
XIV. *Baroda*—									
(*a*) Root-Rot	58,179 0 0	5 0	Feb. 1932	31,827 15 11	....	....	2,981 15 8	28,846 0 3	
(*b*) Comparative tests of 1027 & 1A cottons .	4,280 0 0	1 2	April 1932	4,251 5 3	....	....	145 11 6	4,105 9 9	
(*c*) Survey of Goghari Cotton	5,000 0 0	5 0	Feb. 1935	505 0 0	....	....	....	505 0 0	
(*d*) Plant Puller Propaganda	9,380 0 0	2 0	Not started.	....	....	....	....	....	
XV. *Bengal Comilla Cotton*	18,540 0 0	5 0	Dec. 1934	889 0 0	....	....	114 4 0	774 12 0	
XVI. *Mysore (Doddahathi) Cotton* ..	8,442 0 0	3 0	Not started.	....	....	....	....	....	

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the Scheme.	Total expenditure up to 31st March 1935.	Expenditure from Capital Grants on		Expenditure from annual grants on equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and buildings.	(*b*) Machinery, apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
1. *Bombay*—									
(*i*) Hubli	50,110 0 0	6 0	June 1930	32,445 7 3	....	....	....	32,445 7 3	
(*ii*) Gadag	54,545 0 0	6 0	Do.	33,026 10 9	....	....	....	33,026 10 9	
(*iii*) Gadag Supplementary ..	21,448 0 0	4 0	June 1931	20,188 10 6	....	....	2,929 5 6	17,259 5 0	Scheme closed down on 10th June 1935.
(*iv*) Haveri	27,752 0 0	5 0	....	....	....	....	....	....	Not started.
(*v*) Athani	46,757 0 0	5 0	April 1932	11,786 6 11	....	....	1,001 14 0	10,784 8 11	
(*vi*) Bailhongal	27,425 0 0	5 0	....	....	....	....	....	....	Not started.
(*vii*) Surat	96,050 0 0	9 0	April 1930	35,243 3 1	....	....	....	35,243 3 1	*Recoveries amounting to Rs. 1,10,000 are anticipated from this scheme.
(*viii*) Khandesh	*2,70,340 0 0	5 0	May 1931	1,19,371 12 5	....	....	†10,158 5 11	1,09,213 6 6	†Provisional figure.
(*ix*) Deccan Canals (Banilla)..	‡23,800 0 0	5 0	April 1934	3,505 10 3	....	....	....	3,505 10 3	
(*x*) B. D. 8 Cotton	10,460 0 0	3 0	....	....	....	....	....	....	Not started.
2. *Madras*—									‡This scheme is self-supporting due to anticipated recoveries.
(*i*) Pay and allowances of the Business Manager, Tiruppur..	21,050 0 0	5 0	May 1931	13,026 15 0	....	....	139 4 0	12,887 11 0	
(*ii*) Co. 2.	81,310 0 0	5 0	Sept. 1932	15,132 12 4	....	....	83 13 0	15,048 15 4	
(*iii*) H. 1.	18,860 0 0	(*b*) 2 0	May 1933	3,952 2 9	....	....	....	3,952 2 9	
3. *Punjab*-Lyallpur Ginnery	18,125 0 0	....	....	16,038 3 3	9,221 5 0	6,816 14 3	....	....	(*b*) Scheme closed down on 16th July 1934.
4. *Sind*	3,89,540 0 0	8 0	April 1931	1,33,913 12 11	....	....	5,612 5 6	1,28,301 7 5	
5. *Hyderabad State*	32,400 0 0	6 0	March 1930	23,954 12 1	....	....	....	23,954 12 1	
6. *Central Provinces*—									
(*a*) Verum Cotton	1,17,900 0 0	3 8	Sept. 1930	73,544 2 5	....	....	....	73,544 2 5	Scheme closed down on 30th April 1934.
(*b*) Extension of long staple and marketing of Verum Cotton..	1,25,528 0 0	3 0	April 1934	30,235 0 0	....	....	....	30,235 0 0	
7. *Baroda*	25,600 0 0	5 0	Do.	3,117 4 0	....	....	117 8 0	2,999 12 0	
8. *United Provinces*—									
C. 402	45,800 0 0	5 0	May 1935	....	....	....	....	....	

APPENDIX VII.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from or Yarn Production figures of Mills in Indian States).

Cotton Year 1st September to 31st August.

(In Bales of 400 lb. Nett.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546	611,606	565,084	491,709	687,287
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257	348,009	373,345	326,558
Bombay Presidency	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,132,645	1,116,297	1,063,549	1,230,616
Madras	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707	292,013	278,060	312,164
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820	273,573	277,230	292,424
Central Provinces and Berar	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018	111,208	112,660	125,014
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390	103,784	107,633	101,101
Punjab and Delhi	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681	80,854	71,939	83,897
Rest of British India	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342	31,935	35,139	38,575
Total—British India	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,987,603	2,009,664	1,946,210	2,183,791
Total—Indian States	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341
Total—India	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,346,396	2,360,924	2,336,326	2,612,132

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States).

Cotton Year : 1st September to 31st August.

(In Bales of 400 lb. Nett.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488	33,231	45,588
Mysore	43,571	44,320	39,619	46,590	43,326	49,293	50,596	47,168	51,196
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587	53,612	57,146
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306	49,362	56,318
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,036	111,430	114,229
Kathiawar States	46,809	52,581	57,224	64,454	20,283	18,849	18,868	26,506	35,438
Other Indian States					32,558	39,382	40,209	45,197	45,735
Pondicherry					18,350	20,257	23,170	23,610	22,691
Total ..	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills).

Cotton Year : 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.
Bombay	28,328	24,970	27,324	24,361	54,409	74,979	80,092	74,868	58,355
Madras	35,198	39,560	52,188	46,582	55,717	99,389	96,340	110,875	123,260
United Provinces	16,991	10,308	13,878	20,441	18,496	14,367	19,236	17,871	10,090
Central Provinces and Berar	40,762	20,861	6,924	16,243	15,771	20,743	17,462	18,382	20,544
Punjab	3,910	4,739	3,760	4,361	4,307	2,317	2,149	..	5,535
Total ..	125,189	100,438	104,074	111,988	148,700	211,795	215,279	221,996	217,784

APPENDIX VIII.

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS AND THE TRADE ON 31st AUGUST, 1934 & 1935.

(In thousand bales* of 400 lb. each.)

Trade Descriptions of Cotton.	Trade Stocks on 31st August.								Mill Stocks on 31st August.		Total Indian Trade and Mill Stocks on 31st Aug.	
	Bombay Island.		Karachi.		Rest of India		Total India.		Total India.			
	1934.	1935.	1934.	1935.	1934.	1935.	1934.	1935.	1934.	1935.	1934.	1935.
Bengals—												
United Provinces	—	—	—	—	(a) 16	(a) 9	16	9	20	23	36	32
Punjab	—	—	64	27	(b) 8	(b) 4	72	31	10	8	82	39
Sind	—	—	51	14	—	—	51	14	4	3	55	17
Rajputana	—	—	3	1	—	(c) 1	3	2	17	15	20	17
Others (Unclassified) ..	90	65	—	—	—	(c) 1	90	66	3	3	93	69
Total ..	90	65	118	42	24	15	232	122	54	52	286	174
Oomras—												
Central Provinces Oomras .	21	19	—	—	(d) 1	(d) †5	22	24	27	32	49	56
Berar Oomras	60	24	—	—	(e) 15	(e) 14	75	38	16	11	91	49
Khandesh—Banilla ..	—	—	—	—	—	—	—	—	6	13	6	13
Khandesh Oomras ..	45	19	—	—	—	(f) 4	45	23	16	15	61	38
Central India—Malvi ..	—	—	—	—	—	—	—	—	22	18	22	18
Central India—Others ..	36	14	—	—	(g) 7	(g) 4	43	18	12	10	55	28
Barsi and Nagar Oomras..	26	14	—	—	(h) 1	(h) 4	27	18	7	11	34	29
Total ..	188	90	—	—	24	31	212	121	106	110	318	231
Verum 262	—	—	—	—	—	—	—	—	10	6	10	6
Hyderabad Gaorani ..	1	—	—	—	(h) 27	(h) 10	28	10	67	52	95	62
Total ..	1	—	—	—	27	10	28	10	77	58	105	68
Americans—												
Punjab—289-F	—	—	—	—	—	—	—	—	10	6	10	6
Punjab (Unspecified—4-F)	7	13	34	39	(b) 6	(b) 23	47	75	60	44	107	119
Sind—289-F	—	—	2	7	—	—	2	7	5	10	7	17
Sind (Unspecified—4-F) ..	2	17	6	4	—	—	8	21	13	19	21	40
Dharwar (Gadag 1) ..	—	—	—	—	—	—	—	—	3	6	3	6
Dharwar (Upland—Unspecified)..	—	—	—	—	—	—	—	—	3	1	3	1
Cambodia (Coimbatore No. 2)	—	—	—	—	—	—	—	—	55	61	55	61
Cambodia (Unspecified) ..	20	9	—	—	—	—	20	9	33	35	53	44
Total ..	29	39	42	50	6	23	77	112	182	182	259	294
Broach—												
Surat-Navsari (Surti) ..	6	8	—	—	—	—	6	8	56	26	62	34
Broach (Unspecified) ..	76	22	—	—	(c) 4	(c) 6	80	28	49	30	129	58
Total ..	82	30	—	—	4	6	86	36	105	56	191	92
Dholleras—												
Mattheo	28	18	—	—	—	—	28	18	2	5	30	23
Cutch	—	—	—	—	—	—	—	—	1	2	1	2
Wagad	—	—	—	—	—	—	—	—	42	32	42	32
Dholleras (Unspecified) ..	46	27	—	—	(c) 8	(c) 7	54	34	10	10	64	44
Total ..	74	45	—	—	8	7	82	52	55	49	137	101
Southerns—												
Kumptas (Jayawant) ..	—	—	—	—	—	—	—	—	19	20	19	20
Kumptas (Unspecified) ..	—	—	—	—	—	—	—	—	64	51	64	51
Westerns (Jowari and Mungari)	56	22	—	—	—	(i) 9	56	34	50	42	125	104
Northerns			—	—	—	(i) 3			19	28		
Cocanadas (& Warangal) ..	—	—	—	—	—	(i) 14	—	14	3	5	3	19
Karunganni	—	—	—	—	—	—	—	—	15	20	15	20
Tinnevellies	3	6	—	—	—	—	3	6	30	24	33	30
Salems	—	—	—	—	—	—	—	—	3	2	3	2
Unclassified	33	14	—	—	—	—	33	14	—	—	33	14
Total ..	92	42	—	—	—	26	92	68	203	192	295	260
Comillas	—	—	—	—	—	—	—	—	—	—	—	—
Burmas (Wagale & Wagyi).	—	1	—	—	—	—	—	1	3	1	3	2
Other Sorts (Unclassified) .	6	10	1	—	1	—	8	10	4	—	12	10
Total Indian Cotton ..	562	322	161	92	94	118	817	532	789	700	1,606	1,232

*Standard Indian bales of approximate average gross weight 400 lb., and net weight 392 lb. of cleaned (lint) cotton.

N.B.—Detailed Statement of Mill stocks on the 31st August 1935, is attached.

(a) At Cawnpore.
(b) In the Punjab.
(c) At Ahmedabad.
(d) In the Central Provinces.
(e) In Berar.
(f) In E. & W. Khandesh districts.
(g) In Indore and Gwalior States.
(h) In Hyderabad State.
† Includes 682 bales held at Ahmedabad.
(i) In the Madras Presidency.

STOCKS OF RAW COTTON HELD BY THE

(Compiled from Voluntary

(In thousand bales*

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras North.	Madras South.	Total Madras Presidency.	United Provinces.	Central Provinces.	Berar.	Total C. P. & Berar.	Bengal.
BENGALS—												
United Provinces	2	—	—	2	—	—	—	10	1	—	1	2
Punjab	3	—	—	3	—	—	—	1	—	—	—	1
Sind	2	—	1	3	—	—	—	—	—	—	—	—
Rajputana	2	—	—	2	—	—	—	—	—	—	—	—
Others	2	—	—	2	—	1	1	—	—	—	—	—
Total ..	11	—	1	12	—	1	1	11	1	—	1	3
OOMRAS—												
Central Provinces Oomras ..	4	—	1	5	—	1	1	1	20	1	21	3
Berar Oomras	2	1	—	3	—	—	—	2	3	2	5	1
Khandesh—Banilla ..	—	—	13	13	—	—	—	—	—	—	—	—
Khandesh Oomras ..	4	—	8	12	—	—	—	—	1	2	3	—
Central India—Malvi ..	2	3	—	5	—	—	—	1	—	—	—	—
Central India—Others ..	3	—	—	3	—	—	—	2	1	—	1	—
Barsi and Nagar Oomras..	1	—	4	5	—	—	—	—	—	—	—	—
Total ..	16	4	26	46	—	1	1	6	25	5	30	4
VERUM 262	1	—	—	1	—	—	—	—	3	1	4	—
HYDERABAD GAORANI ..	7	—	19	26	6	—	6	—	9	1	10	—
Total ..	8	—	19	27	6	—	6	—	12	2	14	—
AMERICANS—												
Punjab—289-F	5	—	—	5	—	—	—	—	—	—	—	—
Punjab (Unspecified—4-F).	5	—	1	6	—	7	7	22	—	—	—	3
Sind—289-F	7	1	—	8	—	—	—	—	—	—	—	1
Sind (Unspecified—4-F) ..	3	—	1	4	—	12	12	—	—	—	—	1
Dharwar (Gadag 1) ..	3	1	1	5	—	1	1	—	—	—	—	—
Dharwar (Upland—Unspecified)	—	—	1	1	—	—	—	—	—	—	—	—
Cambodia (Coimbatore No. 2)	8	—	—	8	2	46	48	—	1	1	2	2
Cambodia (Unspecified) ..	16	1	—	17	2	11	13	—	—	—	—	1
Total ..	47	3	4	54	4	77	81	22	1	1	2	8
BROACH—												
Surat-Navsari (Surti) ..	7	10	1	18	—	—	—	—	1	—	1	—
Broach (Unspecified) ..	12	12	2	26	—	1	1	—	—	—	—	1
Total ..	19	22	3	44	—	1	1	—	1	—	1	1
DHOLLERAS—												
Mattheo	4	—	—	4	—	—	—	—	—	—	—	—
Cutch	—	2	—	2	—	—	—	—	—	—	—	—
Wagad	3	21	1	25	—	—	—	—	—	—	—	—
Dholleras (Unspecified) ..	7	3	—	10	—	—	—	—	—	—	—	—
Total ..	14	26	1	41	—	—	—	—	—	—	—	—
SOUTHERNS—												
Kumptas (Jayawant) ..	10	1	2	13	5	—	5	—	1	—	1	—
Kumptas (Unspecified) ..	16	1	10	27	8	—	8	—	—	—	—	1
Westerns (Jowari and Mungari)	12	2	6	20	7	—	7	—	—	—	—	1
Northerns	1	2	—	3	20	1	21	—	—	—	—	—
Cocanadas (& Warangal)..	—	1	1	2	1	—	1	—	—	—	—	—
Karunganni	2	1	1	4	—	14	14	—	—	—	—	1
Tinnevellies	3	1	—	4	—	20	20	—	—	—	—	—
Salems	1	—	—	1	—	1	1	—	—	—	—	—
Total ..	45	9	20	74	41	36	77	—	1	—	1	3
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi)	—	—	—	—	—	—	—	—	—	—	—	—
OTHER SORTS	—	—	—	—	—	—	—	—	—	—	—	—
Total Indian Cotton ..	160	64	74	298	51	116	167	39	41	8	49	19
AMERICANS	28	2	—	30	—	—	—	—	—	—	—	—
EGYPTIANS	8	9	1	18	1	—	1	—	—	—	—	1
EAST AFRICANS	18	21	5	44	—	—	—	1	—	—	—	2
OTHERS (Sudan, Mesopotamia, etc.)	6	2	1	9	—	—	—	—	—	—	—	—
Total Foreign Cotton ..	60	34	7	101	1	—	1	1	—	—	—	3
Grand Total ..	220	98	81	399	52	116	168	40	41	8	49	22

* Standard Indian bales of approximate average gross weight 400 lb.

MILLS IN INDIA ON 31st AUGUST, 1935.

Returns furnished by Mills.)

of 400 lb. each.)

Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
													BENGALS—
5	—	20	—	—	—	3	—	—	—	—	3	23	United Provinces
1	2	8	—	—	—	—	—	—	—	—	—	8	Punjab
—	—	3	—	—	—	—	—	—	—	—	—	3	Sind
—	11	13	—	—	—	—	1	—	1	—	2	15	Rajputana
—	—	3	—	—	—	—	—	—	—	—	—	3	Others
6	13	47	—	—	—	3	1	—	1	—	5	52	Total
													OOMRAS—
—	—	31	—	—	—	—	—	—	1	—	1	32	Central Provinces Oomras
—	—	11	—	—	—	—	—	—	—	—	—	11	Berar Oomras
—	—	13	—	—	—	—	—	—	—	—	—	13	Khandesh—Banilla
—	—	15	—	—	—	—	—	—	—	—	—	15	Khandesh Oomras
—	—	6	—	—	1	3	6	—	2	—	12	18	Central India—Malvi
—	—	6	—	—	—	—	4	—	—	—	4	10	Central India—Others
—	—	5	6	—	—	—	—	—	—	—	6	11	Barsi and Nagar Oomras
—	—	87	6	—	1	3	10	—	3	—	23	110	Total
—	—	5	—	—	—	—	—	—	1	—	1	6	VERUM 262
—	—	42	9	—	—	—	1	—	—	—	10	52	HYDERABAD GAORANI
—	—	47	9	—	—	—	1	—	1	—	11	58	Total
													AMERICANS—
1	—	6	—	—	—	—	—	—	—	—	—	6	Punjab—289-F
3	2	43	—	—	—	—	—	—	—	1	1	44	Punjab (Unspecified-4-F)
—	—	9	—	—	—	—	—	—	1	—	1	10	Sind—289-F
—	—	17	—	—	—	1	—	—	—	1	2	19	Sind (Unspecified—4-F)
—	—	6	—	—	—	—	—	—	—	—	—	6	Dharwar (Gadag 1)
—	—	1	—	—	—	—	—	—	—	—	—	1	Dharwar (Upland—Unspecified)
—	—	60	—	1	—	—	—	—	—	—	1	61	Cambodia (Coimbatore No. 2)
—	—	31	—	1	—	—	—	—	1	2	4	35	Cambodia (Unspecified)
4	2	173	—	2	—	1	—	—	2	4	9	182	Total
													BROACH—
—	—	19	—	—	2	1	2	2	—	—	7	26	Surat-Navsari (Surti)
—	—	28	—	—	—	—	—	—	—	2	2	30	Broach (Unspecified)
—	—	47	—	—	2	1	2	2	—	2	9	56	Total
													DHOLLERAS—
—	—	4	—	—	—	—	—	1	—	—	1	5	Mattheo
—	—	2	—	—	—	—	—	—	—	—	—	2	Cutch
—	—	25	—	—	2	—	—	5	—	—	7	32	Wagad
—	—	10	—	—	—	—	—	—	—	—	—	10	Dholleras (Unspecified)
—	—	41	—	—	2	—	—	6	—	—	8	49	Total
													SOUTHERNS—
—	—	19	—	1	—	—	—	—	—	—	1	20	Kumptas (Jayawant)
—	—	36	—	14	1	—	—	—	—	—	15	51	Kumptas (Unspecified)
—	—	28	1	11	—	—	—	—	1	1	14	42	Westerns (Jowari and Mungari)
—	—	24	—	3	—	—	—	—	—	1	4	28	Northerns
—	—	3	1	—	—	—	—	—	—	1	2	5	Cocanadas (& Warangal)
—	—	19	—	—	—	—	—	1	—	—	1	20	Karunganni
—	—	24	—	—	—	—	—	—	—	—	—	24	Tinnevellies
—	—	2	—	—	—	—	—	—	—	—	—	2	Salems
—	—	155	2	29	1	—	—	1	1	3	37	192	Total
													COMILLAS
—	1	1	—	—	—	—	—	—	—	—	—	1	BURMAS (Wagale & Wagyi)
—	—	—	—	—	—	—	—	—	—	—	—	—	OTHER SORTS
10	16	598	17	31	6	8	14	9	8	9	102	700	Total Indian Cotton
—	—	30	—	—	—	—	—	—	—	1	1	31	AMERICANS
—	—	20	—	3	2	—	—	—	—	—	5	25	EGYPTIANS
—	—	47	—	—	5	—	—	1	—	—	6	53	EAST AFRICANS
1	—	10	—	1	—	—	—	—	—	—	1	11	OTHERS (Sudan, Mesopotamia, etc.)
1	—	107	—	4	7	—	—	1	—	1	13	120	Total Foreign Cotton
11	16	705	17	35	13	8	14	10	8	10	115	820	Grand Total

and net weight 392 lb. of cleaned (lint) cotton.

STOCKS OF "SALEMS," "CAMBODIAS," AND "TINNEVELLIES" HELD IN THE MADRAS PRESIDENCY, BY THE MILLS AND THE TRADE ON 31ST JANUARY 1935.

(In thousand bales of 400 lb. nett.)

Trade descriptions of cotton.	Mill stocks.	Trade stocks.	Total stocks.
Tinnevellies	21	7	28
Salems	10	2	12
Cambodias	42	11	53
Total ..	73	20	93

APPENDIX IX.

EXPORTS BY SEA OF INDIAN RAW COTTON CLASSIFIED BY VARIETIES.

(Compiled from Voluntary Returns furnished by Exporters).

1st September 1934 *to* 31*st August* 1935.

(In thousand bales* of 400 lb. each).

Trade Descriptions of Cotton.	Exported to				
	Europe (excluding United Kingdom) and the West.	United Kingdom.	Japan.	China and the East (excluding Japan).	Total Exports.
BENGALS—					
United Provinces	5	1	19	2	27
Punjab	184	42	230	42	498
Sind	129	33	42	2	206
Rajputana	11	3	4	1	19
Others (Unclassified)	50	31	24	—	105
Total	379	110	319	47	855
OOMRAS—					
Central Provinces—Oomras	38	21	82	—	141
Berar—Oomras	80	7	224	5	266
Khandesh—Banilla	—	—	2	—	2
Khandesh—Oomras	40	3	172	20	235
Central India—Malvi	10	—	1	—	11
Central India—Others	8	1	41	10	60
Barsi and Nagar—Oomras	3	3	62	8	81
Unclassified	23	10	97	—	130
Total	157	45	681	43	926
VERUM 262	—	—	—	—	—
HYDERABAD GAORANI	1	—	1	—	2
Total	1	—	1	—	2
AMERICANS—					
Punjab—289-F	3	4	—	—	7
Punjab (Unspecified—4-F)	143	126	219	8	496
Sind—289-F	—	1	—	—	1
Sind (Unspecified—4-F)	13	16	14	2	45
Dharwar (Gadag 1)	—	—	3	—	3
Dharwar (Upland—Unspecified)	—	—	2	—	2
Cambodia (Coimbatore No. 2)	3	1	—	—	4
Cambodia (Unspecified)	4	4	8	—	16
Total	166	152	246	10	574
BROACH—					
Surat-Navsari (Surti)	3	—	1	—	4
Broach (Unspecified)	46	5	16	—	67
Total	49	5	17	—	71
DHOLLERAS—					
Mattheo	34	2	50	3	89
Cutch	—	—	4	—	4
Wagad	2	—	2	—	4
DHOLLERAS (Unspecified)	3	—	27	—	30
Total	39	2	83	3	127
SOUTHERNS—					
Kumptas (Jayawant)	—	—	—	—	—
Kumptas (Unspecified)	—	—	1	—	1
Westerns (Jowari and Mungari)	7	1	10	1	19
Northerns	12	—	—	—	12
Cocanadas (and Warangal)	8	9	—	—	17
Karunganni	10	1	5	—	16
Tinnevellies	18	2	27	2	49
Salems	1	—	—	—	1
Total	56	13	43	3	115
COMILLAS	29	7	12	1	49
BURMAS (Wagale and Wagyi)	3	—	4	—	7
OTHER SORTS	12	2	102	6	122
Grand Total	891	336	1,508	113	2,848
Total exports, as per official returns, from British Indian and Kathiawar Ports—Bales of 400 lb. net	991	374	1,622	128	3,115

* Standard Indian bales of approximate average gross weight 400 lb. and net weight 392 lb. of cleaned (lint) cotton.

APPENDIX

RECEIPTS AT MILLS IN INDIA OF
(Compiled from Returns
1st *September* 1934 *to*
(In thousand bales*

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Bombay Presidency.	Madras Presidency.	United Provinces.	C. P. & Berar.	Bengal.	Punjab and Delhi.	Rest of British India.
BENGALS—										
United Provinces	12	—	—	12	—	52	2	12	18	—
Punjab	18	—	3	21	—	5	1	3	24	5
Sind	9	1	2	12	—	—	—	1	—	3
Rajputana	20	—	—	20	—	1	—	—	—	15
Others	5	—	2	7	1	11	—	1	—	—
Total ..	64	1	7	72	1	69	3	17	42	23
OOMRAS—										
Central Provinces Oomras	23	1	2	26	2	10	37	20	—	—
Berar Oomras	15	—	—	15	—	6	9	4	—	—
Khandesh—Banilla	3	1	13	17	—	—	1	—	—	—
Khandesh—Oomras	17	1	26	44	—	—	9	—	—	—
Central India—Malvi	9	12	2	23	—	6	—	—	—	—
Central India—Others	23	2	5	30	—	21	—	—	—	—
Barsi and Nagar Oomras	4	—	13	17	—	—	1	—	—	—
Total ..	94	17	61	172	2	43	57	24	—	—
VERUM 262	3	1	—	4	—	—	13	1	—	—
HYDERABAD GAORANI	19	—	40	59	2	—	20	—	—	—
Total ..	22	1	40	63	2	—	33	1	—	—
AMERICANS—										
Punjab—289-F	12	—	—	12	1	8	—	6	1	—
Punjab (Unspecified—4-F)	18	—	1	19	17	51	—	15	28	4
Sind—289-F	18	2	2	22	—	—	—	1	—	—
Sind (Unspecified—4F)	16	2	1	19	24	9	—	3	—	—
Dharwar (Gadag 1)	11	1	11	23	—	—	—	—	—	—
Dharwar (Upland—Unspecified) ..	4	—	3	7	—	—	—	1	—	—
Cambodia (Coimbatore No. 2) ..	14	3	1	18	88	—	1	6	—	—
Cambodia (Unspecified)	47	2	—	49	29	1	—	5	—	—
Total ..	140	10	19	169	159	69	1	37	29	4
BROACH—										
Surat-Navsari (Surti)	32	43	4	79	—	—	2	2	—	—
Broach (Unspecified)	83	36	2	121	1	—	—	1	—	3
Total ..	115	79	6	200	1	—	2	3	—	3
DHOLLERAS—										
Mattheo	18	2	—	20	—	—	—	—	—	—
Cutch	4	5	2	11	—	—	—	—	—	—
Wagad	12	95	2	109	—	—	—	—	—	—
Dholleras (Unspecified)	23	12	1	36	—	—	—	—	—	—
Total ..	57	114	5	176	—	—	—	—	—	—
SOUTHERNS—										
Kumptas (Jayawant)	28	2	5	35	3	—	1	1	—	—
Kumptas (Unspecified)	58	2	25	85	3	1	—	1	—	—
Westerns (Jowari and Mungari) ..	57	13	25	95	14	5	—	6	—	—
Northerns	3	6	—	9	20	—	—	1	—	—
Cocanadas (& Warangal)	2	3	1	6	4	—	—	1	—	—
Kurunganni	3	3	1	7	30	—	—	2	—	—
Tinnevellies	5	1	1	7	36	—	—	3	—	—
Salems	4	1	—	5	7	—	—	—	—	—
Total ..	160	31	58	249	117	6	1	15	—	—
COMILLAS	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi)	—	—	—	—	—	—	—	1	—	14
OTHER SORTS	—	—	—	—	3	—	—	—	—	—
Total Indian Cotton ..	652	253	196	1,101	285	187	97	98	71	44
AMERICANS	48	12	1	61	1	—	—	1	—	—
EGYPTIANS	62	40	3	105	2	—	—	3	1	—
EAST AFRICANS	60	98	11	169	1	1	1	10	3	—
OTHERS (Sudan, Mesopotamia, etc.) ..	23	5	2	30	—	—	—	1	—	—
Total Foreign Cotton ..	193	155	17	365	4	1	1	15	4	—
Grand Total ..	845	408	213	1,466	289	188	98	113	75	44
Indian raw cotton consumed in Indian mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lb. net)	687	327	217	1,231	312	292	125	101	84	39

* Standard Indian bales of approximate average

X.

RAW COTTON CLASSIFIED BY VARIETIES.
furnished by Mills).
31*st August* 1935.
of 400 lb. each).

Total British India.	Hyderabad	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
											BENGALS—
96	—	—	—	12	—	—	1	—	13	109	United Provinces
59	—	—	—	—	—	—	—	—	—	59	Punjab
16	—	—	—	—	—	—	—	—	—	16	Sind
36	—	1	2	2	5	—	8	—	18	54	Rajutana
20	—	—	—	—	—	—	—	—	—	20	Others
227	—	1	2	14	5	—	9	—	31	258	Total
											OOMRAS—
95	1	—	—	—	—	—	4	—	5	100	Central Provinces Oomras
34	—	—	—	—	—	—	—	—	—	34	Berar Oomras
18	—	—	1	—	—	—	1	—	2	20	Khandesh—Banilla
53	—	—	—	—	—	—	1	1	2	55	Khandesh Oomras
20	—	—	2	24	42	—	9	—	77	106	Central India—Malvi
51	—	—	2	—	35	—	—	—	37	88	Central India—Others
18	9	—	—	—	—	—	1	—	10	28	Barsi and Nagar Oomras
298	10	—	5	24	77	—	16	1	133	431	Total
18	—	—	1	—	1	—	—	1	3	21	VERUM 262
81	31	—	—	—	1	—	1	—	33	114	HYDERABAD GAORANI.
99	31	—	1	—	2	—	1	1	36	135	Total
											AMERICANS—
28	—	—	—	1	—	—	1	—	2	30	Punjab—289-F
134	—	—	—	—	—	—	3	2	5	139	Punjab (Unspecified—4-F)
23	—	—	—	—	1	1	—	—	2	25	Sind—289-F
55	—	—	—	10	—	—	—	2	12	67	Sind (Unspecified—4-F)
23	—	—	1	—	—	—	—	—	1	24	Dharwar (Gadag 1)
8	—	—	—	—	—	—	—	—	—	8	Dharwar (Upland—Unspecified)
113	—	1	—	—	—	—	3	3	7	120	Cambodia (Coimbatore No. 2)
84	—	2	—	—	—	—	2	—	4	88	Cambodia (Unspecified)
468	—	3	1	11	1	1	9	7	33	501	Total
											BROACH—
83	—	—	4	1	11	5	1	1	23	106	Surat-Navsari (Surti)
126	—	—	5	—	—	1	1	3	10	136	Broach (Unspecified)
209	—	—	9	1	11	6	2	4	33	242	Total
											DHOLLERAS—
20	—	—	—	—	—	2	—	—	2	22	Mattheo
11	—	—	—	—	—	—	—	—	—	11	Cutch
109	—	—	10	—	—	16	2	—	30	139	Wagad
36	—	—	2	—	—	—	—	—	2	38	Dholleras (Unspecified)
176	—	—	12	—	—	20	2	—	34	210	Total
											SOUTHERNS—
40	—	12	1	—	—	—	—	—	13	53	Kumptas (Jayawant)
90	—	11	1	—	—	1	2	—	15	105	Kumptas (Unspecified)
120	3	14	—	—	—	—	1	3	21	141	Westerns (Jowari and Mungari)
30	—	2	1	—	—	—	—	1	4	34	Northerns
11	5	—	—	—	—	—	—	2	7	18	Cocanadas (& Warangal)
39	—	—	—	—	—	—	1	—	1	40	Karunganni
46	—	9	—	—	—	—	—	—	9	55	Tinnevellies
12	—	—	—	—	—	—	—	—	—	12	Salems
388	8	48	3	—	—	1	4	6	70	458	Total
—	—	—	—	—	—	—	—	—	—	—	COMILLAS
15	—	—	—	—	—	—	—	—	—	15	BURMAS (Wagale & Wagyi)
3	—	—	—	—	—	—	1	—	1	4	OTHER SORTS
1,883	49	52	33	59	96	28	44	19	371	2,254	Total Indian Cotton
63	—	—	—	—	—	—	—	1	1	64	AMERICANS
111	—	6	6	—	—	—	—	—	12	123	EGYPTIANS
185	—	—	22	—	1	4	—	—	27	212	EAST AFRICANS
31	—	—	1	—	—	—	1	—	2	33	OTHERS (Sudan, Mesopotamia, etc.)
390	—	6	29	—	1	4	1	1	42	432	Total Foreign Cotton
2,273	49	58	62	59	97	32	45	20	413	2,686	Grand Total
2,184	46	51	57	56	114	35	46	23	428	2,612	Indian raw cotton consumed in Indian mills. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lb. net).

gross weight 400 lb. and net weight 392 lb. of cleaned (lint) cotton.

APPENDIX XI.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935.

		INDIAN CENTRAL COTTON COMMITTEE OFFICE.	
1.	Secretary	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S.,.	On deputation from Madras Department of Agriculture.
2.	Deputy Secretary	Vacant	
3.	Publicity Officer	Mr. R. D. Mihra, M.A., Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), Post-Grad., Res. B. Litt. (Oxon.)	——
		TECHNOLOGICAL LABORATORY, BOMBAY.	
4.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), F.Inst.P.	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
5.	Spinning Master	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical School, Oldham.
6.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I.Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
7.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
8.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Research Scholar, Technological Laboratory (Textile Physics).
9.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U.P.
10.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

11.	Junior Research Assistant	Dr. K. R. Sen, D.Sc. (Dacca)	Research Scholar, Technological Laboratory, and Technological Assistant, Lyallpur.
12.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
13.	Temporary Chemist	Dr. Lavji Thoria, Dr.Ing. (Germany) ..	——
14.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	——
15.	Spinning Assistant	Mr. N. Iyengar	——
16.	Senior Tester	Mr. H. B. Joshi, B.Sc.	——
17.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	——
18.	Junior Tester	Mr. K. G. Deo	——
19.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
20.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
21.	Junior Tester	Mr. K. V. N. Nayar	——
22.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
23.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
24.	Junior Tester	Mr. P. S. Sambamurthy	——
25.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
26.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——
27.	Junior Tester	Mr. A. J. Farid	——
28.	Junior Tester	Mr. U. K. Benegal, B.A.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

29	Junior Tester	Mr. P. V. Nachane, B.Sc.	—
30	Junior Tester	Mr. A. B. Khan, B.Sc.	—
31.	Junior Tester	Mr. C. S. Ramanathan, B.Sc.	—
32.	Junior Tester	Mr. M. R. Raut, M.Sc.	—
33.	Draughtsman	Mr. B. G. Mehta	—
34.	Statistical Clerk	Mr. R. Krishna Iyer	—
35.	Statistical Clerk	Mr. P. K. Wagle	—
36.	Mechanic	Mr. J. B. Kharas	—

INSTITUTE OF PLANT INDUSTRY, INDORE.

37.	Director	Mr. F. Keith Jackson, N.D.A. (Hons.), Dip. Agri. (Cantab.).	Director of Research Department of Agriculture, Iraq (1923-30).
38.	Geneticist and Botanist	Mr. J. B. Hutchinson, M.A. (Cantab.) ..	Assistant Geneticist and Botanist, Trinidad (1926-33).
39.	Chemist and Agronomist	Mr. Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Research Student, Indian Central Cotton Committee.
40.	Extension Officer	Mr. Misri Lal Saxena, L.Ag. (Cawnpore) ..	Six years as Assistant Farm Superintendent, United Provinces Subordinate Agricultural Service.
41.	Farm Superintendent	Mr. G. C. Tambe, B.Ag. (Bombay)	—
42.	Plant Breeding Assistant	Mr. Kuber Singh, B.Ag. (Bombay)	—
43.	Senior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad) ..	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*contd.*

44.	Assistant Farm Superintendent ..	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
45.	Junior Farm Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	——
46.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow) ..	——
47.	Statistical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	——
48.	Genetical Assistant	Mr. Bholanath, M.Sc. (Punjab)	——
49.	Junior Plant Breeding Assistant (Temporary).	Mr. N. S. Apte, B.Ag. (Bombay)	——
50.	Chemical and Agronomical Assistant ..	Mr. I. Madhusudan Rao, B.A. (Hons.) ..	——
51.	Artist	Mr. J. S. Oncar	——
		BOMBAY RESEARCH SCHEMES.	
		(*i*) *Broach Cotton Breeding Scheme.*	
52.	Cotton Breeder	Mr. P. L. Patel, M.Sc. (Iowa, U.S.A.) ..	——
53.	Botanical Assistant	Mr. A. K. Shah, B.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
54.	Pathological Assistant	Mr. Y. S. Kulkarni, B.Ag. (Bombay) ..	——
		(*ii*) *Jalgaon Cotton Breeding Scheme.*	
55.	Botanical Assistant	Mr. V. L. Bhosekar, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
56.	Pathological Assistant	Mr. J. D. Ranadive, B.Ag. (Bombay) ..	Research Student, Indian Central Cotton Committee.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES.

(*i*) *Hubli Scheme.*

57.	Agricultural Overseer	Mr. B. S. Patil, B.Ag. (Bombay)	——	

(*ii*) *Gadag Scheme.*

58.	Agricultural Overseer	Mr. B. S. Tadsur, B.Ag. (Bombay)	——	

(*iii*) *Surat Scheme.*

59.	Cotton Assistant	Mr. V. D. Desai	On deputation from Bombay Department of Agriculture.	
60.	Cotton Assistant	Mr. V. V. Patel, B.Ag. (Bombay)	Do.	do.

(*iv*) *Athani Scheme.*

61.	Agricultural Overseer	Mr. B. M. Dhumma, B.Ag. (Bombay) ..	——	

(*v*) *Khandesh* (*Banilla*) *Scheme.*

62.	Cotton Superintendent, Amalner ..	Mr. S. V. Shevde, L.Ag.	On deputation from Bombay Department of Agriculture.	
63.	Agricultural Overseer	Mr. R. B. Nimbalkar, B.Ag. (Bombay) ..	Do.	do.
64.	Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag. (Bombay) ..	Do.	do.

BOMBAY COTTON FORECAST IMPROVEMENT SCHEME.

65.	Provincial Officer	Mr. G. R. Ambekar, School Final	On deputation from Bombay Department of Agriculture.	

SIND PHYSIOLOGICAL RESEARCH SCHEME.

66.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)	——	
67.	Senior Assistant	Dr. A. M. Shaikh, M.Sc. (Bombay), Ph.D. (London), D.I.C., A.I.C.	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

SIND PHYSIOLOGICAL RESEARCH SCHEME—*contd.*

68.	Junior Assistant	Mr. Rustom M. Ranji, Dip.Ag. (Bombay) ..	——	
69.	Junior Assistant	Mr. H. W. Mughal, Dip. Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.	
70.	Junior Assistant	Mr. T. J. Malkani, M.Sc. (with distinction) (Bombay).	——	
71.	Statistical Assistant	Mr. S. S. Chiney, B.Sc. (Agra)	——	

SIND SEED DISTRIBUTION SCHEME.

72.	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture.	
73.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. Ghulam Mustafa, Practical Experience in Agriculture.	On deputation from Sind Department of Agriculture.	
74.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Agha Khan Mahomed, 2 years' Lyallpur Course.	Do.	do.
75.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. P. Shahani, B.Ag. (Bombay).. ..	Do.	do.
76.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj	Do.	do.
77.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani	——	
78.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. A. M. Kureshi	——	
79.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Premsing T. Advani	——	

SIND SEED DISTRIBUTION SCHEME—*contd.*

80.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Partabsingh J. Bakshi	——
81.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. S. A. Sidiki, Dip. Agri. (Bombay) ..	——
82.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. K. S. Tharumal	On deputation from Sind Department of Agriculture.
83.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. T. T. Naraindas	——
84.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Atmaram	——
85.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Nek Mahomed	——
86.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Suleman	——

CENTRAL PROVINCES RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

87.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture.
88.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post-Graduate, Pusa.	Do. do.
89.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
90.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.
91.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do. do.

CENTRAL PROVINCES BOTANICAL RESEARCH SCHEME—*contd.*

92.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	On deputation from Central Provinces Department of Agriculture.
93.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	——

(*ii*) *Entomological Scheme.*

94.	Agricultural Assistant	Mr. M. S. Patil, B.Ag.	——

COMBINED LONG-STAPLE COTTON AND MARKETING OF VERUM COTTON SCHEMES IN C. P. AND BERAR.

95.	Agricultural Assistant	Mr. J. P. Tiwari, B.Ag.	——
96.	Agricultural Assistant	Mr. L. P. Khare, B.Ag.	——
97.	Agricultural Assistant	Mr. G. N. Wardadkar, B.Ag.	——
98.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
99.	Agricultural Assistant	Mr. N. B. Chincholkar, B.Ag.	——
100.	Agricultural Assistant	Mr. J. N. Kelkar, B.Ag.	——
101.	Agricultural Assistant	Mr. G. C. Tiwari, Certificate Course of Agricultural College, Nagpur.	——
102.	Agricultural Assistant	Mr. W. R. Patwardhan, B.Ag.	——
103.	Agricultural Assistant	Mr. K. S. S. Chowdhary, B.Ag.	——
104.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
105.	Agricultural Assistant	Mr. Mohammad Ishaqe, B.Ag.	——
106.	Agricultural Assistant	Mr. N. P. Konher, B.Ag.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

COMBINED LONG-STAPLE COTTON AND MARKETING OF VERUM COTTON SCHEMES IN C.P. AND BERAR—*contd.*

107.	Agricultural Assistant	Mr. N. K. Galande, B.Ag.	——	

MADRAS RESEARCH SCHEMES.

(*i*) *Herbaceum Scheme.*

108.	Senior Assistant	Mr. R. Balasubramania Ayyar, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.	
109.	Junior Assistant	Mr. G. Seshadri Ayyangar, M.A.	——	
110.	Junior Assistant	Mr. V. Ramaswami Mudaliar, B.A.	——	
111.	Sub-Assistant	Mr. D. Devasirvatham, S.S.L.C. (Botany) (Intermediate).	On deputation from Madras Department of Agriculture.	

(*ii*) *Pempheres and Physiological Scheme.*

112.	Bio-Chemist	Dr. S. Kasinatha Ayyar, B.A., Ph.D. (London).	On deputation from Madras Department of Agriculture.	
113.	Physiological Botanist	Mr. T. R. Narayana Ayyar, B.A. (Cantab.), B.Sc. (Ag.).	Do.	do.
114.	Assistant Botanist	Mr. K. Dharma Rajulu, M.Sc. (Bombay) ..	Research Student, Indian Central Cotton Committee.	
115.	Assistant Botanist	Mr. N. G. Narayanan, B.Sc.(Ag.).	——	
116.	Assistant Entomologist	Mr. V. Margabandu, M.A.	On deputation from Madras Department of Agriculture.	
117.	Assistant Entomologist	Mr. P. S. Narayanaswami, B.Sc. (Ag.) ..	Do.	do.
118.	Assistant Chemist	Mr. K. Saptharishi, B.Sc.(Ag.)	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

MADRAS RESEARCH SCHEMES—*contd.*

(iii) Fodder Cholam Scheme.

119.	Assistant	Mr. M. R. Balakrishnan, B.A., B.Sc. (Agri.).	On deputation from Madras Department of Agriculture.	
120.	Assistant	Mr. S. Sundaram, B.A., B.Sc. (Agri.) ..	Do.	do.

(iv) Breeding of Nadam Cotton.

121.	Assistant	Mr. R. Krishnamurthi, B.Sc. (Ag.)	Do.	do.

MADRAS SEED DISTRIBUTION SCHEMES.

(i) Pay of Business Manager.

122.	Business Manager, Tiruppur Co-operative Trading Society, Ltd.	Mr. K. Avudanayakam Pillai, S.S.L.C., L. Ag.	On deputation from Madras Department of Agriculture.

(ii) Co. 2 Scheme.

123.	Agricultural Demonstrator	Mr. Damodara Prabhu, B.Sc. (Agri.)	Do.	do.
124.	Agricultural Demonstrator	Mr. L. Krishnan, B.A., B.Sc. (Agri.) ..	Do.	do.
125.	Agricultural Demonstrator	Mr. P. P. Syed Mohamed, B.Sc. (Agri.) ..	Do.	do.
126.	Agricultural Assistant	Mr. P. N. Muthuswami, B.Sc. (Agri.) ..	Do.	do.
127.	Agricultural Assistant	Mr. T. S. Lakshmanan, B.Sc. (Agri.) ..	Do.	do.

PUNJAB RESEARCH SCHEMES.

(i) Botanical Scheme.

128.	Cotton Research Botanist	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee, and State Research Scholar. On deputation from Punjab Department of Agriculture.
129.	Assistant to Cotton Research Botanist.	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*i*) *Botanical Scheme*—contd.

130.	Agricultural Assistant	Mr. Saroop Singh, L.Ag., M.Sc. (Texas), U.S.A.	On deputation from Punjab Department of Agriculture.
131.	Agricultural Assistant	Bh. Autar Singh, B.Sc. (Agri.)	——
132.	Agricultural Assistant	Mr. Akbar Ali, B.Sc. (Post-Graduate) ..	Research Student, Indian Central Cotton Committee. On deputation from Punjab Department of Agriculture.
133.	Agricultural Assistant	Bh. Santokh Singh, B.Sc. (Agri.)	——
134.	Agricultural Assistant	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Fazil, F.A. (Punjab University).	On deputation from Punjab Department of Agriculture.
135.	Statistical Assistant	Mr. Bhagat Ram Sehgal, M.A. (Punjab) ..	——

(*ii*) *Entomological* (*Pink and Spotted Boll-worm*) *Scheme.*

136.	Assistant Cotton Entomologist ..	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	——
137.	Field Assistant, Research Work ..	Mr. Ladha Ram, B.Sc.	——
138.	Field Assistant, Research Work ..	L. Ganda Ram, B.Sc., F.E.L.	——
139.	Field Assistant	Mr. Piare Mohan, B.Sc. (Hons.), M.Sc. ..	——
140.	Field Assistant	Mr. Manzoor Abbas, B.Sc. (Agri.)	——
141.	Field Assistant	Mr. Ghulam Ullah, B.Sc. (Agri.)	——
142.	Field Assistant	Mr. Dharm Bir Kohli, B.Sc. (Agri.)	——
143.	Junior Research Assistant	Mr. Abdul Ghani, B.Sc. (Agri.)	——
144.	Statistical Assistant	Mr. Prithvi Nath, B.Sc. (Agri.)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(iii) White Fly Scheme.

145.	Assistant Cotton Entomologist ..	L. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee.
146.	Field Assistant	Mr. Hari Chand, B.Sc. (Agri.)	——

(iv) Root Rot Scheme.

147.	Assistant Cotton Mycologist	Dr. R. S. Vasudeva, B.Sc., Ph.D. (London), D.I.C. (London).	——

(v) Physiological (Periodic Partial Failure) Scheme.

148.	Plant Physiologist	Prof. R. H. Dastur, M.Sc., F.L.S.	On deputation from Bombay Educational Department.
149.	Bio-Chemist	Dr. A. V. Varadaraja Iyengar, D.Sc. (Madras), A.I.D.Sc., A.I.C.	——
150.	Agricultural Assistant	Mr. Abdul Ahad, B.Sc. (Agri).	——
151.	Agricultural Assistant	Bh. Such Singh, B.Sc. (Agri).	——
152.	Statistician	Mr. Kewal Kishan, M.A.	——

UNITED PROVINCES, ROHILKHAND AND BUNDELKHAND SURVEY SCHEME.

153.	Agricultural Inspector	Mr. Attar Sing, L.Ag. (Cawnpore)	On deputation from the United Provinces Department of Agriculture.

HYDERABAD RESEARCH SCHEMES.

(i) Botanical Scheme.

154.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab) ..	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
155.	Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona) ..	On deputation from Bombay Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*contd.*

HYDERABAD RESEARCH SCHEMES—*contd.*

		(*i*) *Botanical Scheme—contd.*	
156.	Assistant Cotton Research Botanist ..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.
157.	Inspector, Variety Testing Stations ..	Mr. N. R. Yardi, B.Ag. (Bombay)	——
		(*ii*) *Cotton Survey Scheme.*	
158.	Assistant Botanist	Mr. B. B. Mulchandani, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
159.	Graduate Assistant	Mr. M. A. Jaleel, B.Sc. (Agri.) (Coimbatore) ..	——
		(*iii*) *Hyderabad (Pink and Spotted Boll-worm) Scheme.*	
160.	Cotton Entomologist	Mr. H. D. Nangpal, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee and Assistant Entomologist, United Provinces Pink Boll-worm Scheme.
161.	Senior Research Assistant	Mr. N. T. Nadkerny, B.Ag. (Bombay), Post-Graduate Course in Entomology at Poona Agricultural College.	——
162.	Junior Research Assistant	Mr. T. E. Krishnaswamy, B.Sc. (Agri.) (Coimbatore).	——
		HYDERABAD SEED DISTRIBUTION SCHEME.	
163.	Inspector	Mr. M. V. Chitnis	——
		BARODA ROOT ROT SCHEME.	
164.	Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay), B.Sc. ..	On deputation from Bombay Department of Agriculture.
165.	Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	——
166.	Mycological Assistant	Mr. G. H. Desai, B.Ag. (Bombay)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1935—*concld.*

BIKANER GANG CANAL SCHEME.

167.	Cotton Assistant	Mr. Arjan Singh, B.Sc...	——	
168.	Mechanic	Mr. Jagir Singh	——	

Bengal Comilla Cotton Scheme.

169.	Agricultural Officer	Mr. H. K. Majumdar, M.Sc.	——	

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

170.	Under Cotton Specialist, Coimbatore ..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.	
171.	Under Cotton Breeder, Dharwar ..	Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.	
172.	Under Cotton Research Botanist, Lyallpur.	Mr. K. G. Deo	Do.	do.
173.	Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Research Student, Indian Central Cotton Committee.	
174.	Under Botanist, Agricultural Research Station, Sakrand	Mr. K. S. Marar, B.A., LL.B.	Formerly Junior Tester at Technological Laboratory, Bombay.	

APPENDIX XII.

RESEARCH STUDENTSHIPS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammed Afzal, B.Sc. (Punjab).	Do.	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Do.
,,	Jiwan Singh, M.Sc. (Punjab).	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
6 1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Sind Agricultural Department, Cotton Breeder, Sind, Mirpurkhas.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
4 ,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	Entomologist, Hyderabad Pink and Spotted Bollworm scheme, Parbhani.	Late Special Research Assistant, Pink Bollworm Investigation, United Provinces.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology..	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph. D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore ..	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
8 ,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding.)	Punjab Agricultural Department, Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology.	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	....	Technological Assistant, Dharwar, up to 31st July 1929. Went abroad for further study.
8 ,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee. Obtained a Doctorate (D.Sc.) in 1934.
,,	L. N. Rao, M.Sc. (Calcutta). .	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
7 1926	D. F. Kapadia, B.A. (Bombay), M.Sc. (Tech.), (Manchester).	Do. ..	Cotton Technology .	Head of the Textile Manufactures Department, Victoria Jubilee Technical Institute, Bombay.	Late Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	Ram Saran Koshal, M.Sc. (Punjab).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology..	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	Awarded a Training Grant for foreign study in 1933.
,,	Karam Singh Lamba, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
7 ,,	Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Coimbatore.. ..	Cotton Bio-chemistry.	Chemist and Agronomist, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Sind Agricultural Department, Cotton Supervisor, Indus Right Bank, Sind Seed Distribution Scheme, Dadu.	Do.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Assistant Farm Superintendent, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Technological Assistant, Coimbatore.	Do.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
9 ,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology	....	Secured Government Scholarship for study abroad and obtained Ph. D. (Cantab).

RESEARCH STUDENTSHIPS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1927	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Cotton Entomology.	Assist. Professor of Zoology and Entomology, Agricultural College, Cawnpore.	Obtained Doctorate at Edinburgh.
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University).	Institute of Plant Industry, Indore.	Cotton Physiology..	Unemployed	....
,,	Sant Singh Verma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	....	Awarded a Foreign Scholarship by the Indian Central Cotton Committee. Obtained Ph. D. (Lond.)
,,	Lakshmi Narayan, Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Unemployed	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy..	Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab), M.Sc.	Cawnpore	Cotton Entomology	Field Assistant, Parasite Work, Pink and Spotted Boll-worm Scheme, Punjab.	Do.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Sind Agricultural Department. Inspector of Agriculture, Eastern Nara Circle, Mirpurkhas.	....
,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (University of Edin.)	Institute of Plant Industry, Indore.	Do. ..	Madras Agricultural Service.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
	1929	Srinagabhushana, B.Sc. ..	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Surat.	Indian Central Cotton Committee.
3	,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
	,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do.	Do. ..	Do. ..	....
	1930	Madan Lal Bhatia, M.Sc. (Punjab).	Do.	Entomology ..	Abroad for further study ..	....
4	,,	Bhola Nath, M.Sc. (Punjab) ..	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Genetical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
	,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
	,,	Brajendra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	....	....
	1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Do. ..	....	Resigned.
4	,,	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	Dist. Supervisor, Enquiry into the cost of production of Cotton and Sugar-cane crops, Central Provinces.	....
	,,	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
	,,	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras	Do. ..	Madras Agricultural Service.	....
1	1935	Krishna Behari Lal, M.Sc. (Cal.) Ph. D. (Edinburgh).	Lyallpur	Cotton Entomology	Research Student	Under training.
			Foreign Research Studentships.			
1	1931	Sant Singh Verma, M.Sc. (Benares Hindu University).	Imperial College of Science and Technology, London.	Plant Physiology ..	....	Completed training, July 1935. Obtained Ph.D. of London University.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
		Training Grants.			
2 1933	S. N. Venkatramanan, B.A., B.Sc. (Agri.) (Madras).	Calcutta	Cotton Statistics ..	Madras Agricultural Service	....
2 ,,	C. Jagannatha Rao, B.A. (Madras).	....	Cotton Physiology	Research Student	Under training.
		Foreign Training Grants.			
2 1933	M. Taskhir Ahmad, B.Sc. (Agri.) (Punjab).	Trinity College, Cambridge.	Entomology ..	Assistant Entomologist, Imperial Institute of Agricultural Research, Pusa.	....
2 ,,	G. B. Patel, B. Ag. (Bombay).	University of California, U.S.A.	Cotton Breeding ..	Research Student	Under training.
2 1934	M. A. Shama Iyengar, B.Ag. (Bombay).	Tour in Hungary, England and Egypt.	Study of Kalar (alkali) lands and cultivation of superior Egyptian cottons with special reference to soil and environmental conditions.	Sind Agricultural Department. Senior Assistant to Agricultural Chemist and Soil Physicist.	....
2 ,,	Nazir Ahmad, M.Sc. (Punjab).	Imperial College of Science and Technology, London.	Entomology ..	Research Student	Under training.

" Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants

ANNUAL REPORT

OF THE

INDIAN CENTRAL COTTON COMMITTEE,

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FOR THE

YEAR ENDING 31st AUGUST

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Annual Report of the Indian Central Cotton Committee for the year ending 31st August 1936.

CHAPTER I.

As a result of one of the recommendations of the Indian Cotton Committee of 1917-18, the Indian Central Cotton Committee was constituted by the Government of India in the Department of Revenue and Agriculture, in their Resolution No. 404-22, dated the 31st March 1921. Originally its functions were purely of an advisory character but with its incorporation under the Indian Cotton Cess Act in 1923, the Committee became an administrative body having at its disposal funds "for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee thus exercises its functions in a dual capacity. Firstly, it advises the Government of India, local Governments and Indian States on subjects connected with the growing and marketing of cotton and brings to their notice matters which, in its opinion, require attention. Secondly, it provides funds for research into cotton problems of an All-India importance or for large areas where cotton is an important crop, and for the extension and marketing of improved varieties of cotton. The research portion of the Committee's work has passed the experimental stage, as will be seen in Chapters IV and V of this report.

The Committee also serves as a common meeting-ground for all branches of the cotton industry, since all the main interests associated with cotton, *viz.*, the grower, the ginner, the exporter, the millowner and the agricultural expert are represented on it. Whilst the Committee's constitution thus ensures a broad outlook on the many problems affecting the cotton industry, its primary concern is the interest and welfare of the cotton grower.

PERSONNEL.

2. In *Appendix I* will be found a list of members of the Committee as it stood on the 31st August 1936. Under the Indian Cotton Cess Rules, members, who are not *ex-officio* members, hold office for three years and one-third of their number retire each year in rotation.

Dr. F. J. F. Shaw, C.I.E., I.A.S., Offg. Agricultural Expert to the Imperial Council of Agricultural Research and an *ex-officio* member of the Committee, died during the year and the Committee, at its meeting in August 1936, recorded its appreciation of the services rendered by him not only to the Committee but also to the country as a whole.

SUB-COMMITTEES.

3. Most of the detailed work of the Committee is carried on by means of Sub-Committees and thereby much of its time is saved at its half-yearly meetings. The Committee is greatly indebted to the members of the various Sub-Committees for their invaluable assistance and hearty co-operation in furthering the work of the Committee; more particularly are its thanks due to the members of the Standing Finance and Local Sub-Committees who are required to attend to the business of the Committee at more frequent intervals.

The functions of the various Sub-Committees are detailed below and their composition as on the 31st August 1936 is given in *Appendix II.*

(*a*) *The Standing Finance Sub-Committee* is a statutory Sub-Committee and is the principal executive body of the Committee. By a resolution of the Committee one of the members of this Sub-Committee must be a representative of cotton growers. Eight meetings of this Sub-Committee were held during the year.

(*b*) *The Local Sub-Committee* deals with all matters of a general nature, not involving finance, which cannot be postponed for consideration to the half-yearly meetings of the full Committee. Eight meetings of this Sub-Committee were held during the year.

(*c*) *The Cotton Ginning and Pressing Factories Sub-Committee* is appointed by statute to deal with matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. This Sub-Committee did not meet during the year. The more routine work of this Sub-Committee was disposed of by the Local Sub-Committee.

(*d*) *The Agricultural Research Sub-Committee* ordinarily assembles half-yearly during the meetings of the full Committee; it reports on the progress made on schemes financed by the Committee, examines proposals for new schemes or extensions of those already in operation and considers the reports of research students.

(*e*) *The Technological Research Sub-Committee,* like the Agricultural Research Sub-Committee, generally meets during the half-yearly meetings of the full Committee and deals with all matters connected with the Technological Laboratory and technological research.

(*f*) *The Research Students Selection Sub-Committee,* as its name implies, selects students to whom scholarships or training grants are awarded for the purpose of undergoing training in research in the several sciences relating to cotton. One meeting of this Sub-Committee took place during the year.

(*g*) *The Sub-Committee on Malpractices* was originally formed with the object of dealing with all references concerning abuses and malpractices in regard to Indian cotton. As it was felt that the work of this Sub-Committee could conveniently be dealt with by the Cotton Ginning and Pressing Factories Sub-Committee, the full Committee resolved at its meeting held in January 1936 to discontinue it.

(*h*) *The Forecast Improvement Sub-Committee* usually meets half-yearly, its principal business being the improvement of the cotton forecasts of India.

(*i*) *The Special Sub-Committee on Wider Markets* was appointed in 1933 with the object of examining the question of finding wider markets for Indian cotton. It met twice during the year under report.

(*j*) *The Standards Sub-Committee* was constituted in April 1933 and is concerned with the preparation for use in India of universal standards of certain growths of cotton dealt with in common both by the East India Cotton Association and the Karachi Cotton Association and of certain other varieties with which only the former Association is concerned. Six meetings of this Sub-Committee were held during the year.

In addition to the abovementioned Standing Sub-Committees, special Sub-Committees are appointed from time to time to deal with specific matters which do not fall within the purview of any of the other Sub-Committees.

4. Whilst the Committee is representative of practically all sections of the cotton trade in India, it also enjoys the privilege of deputing representatives to serve on other bodies. Thus Sardar Rao Bahadur Bhimbhai Ranchodji Naik represents it on the Imperial Council of Agricultural Research and he along with Mr. N. M. Deshmukh and Sardar Sampuran Singh represented the Committee on the Board of Directors of the East India Cotton Association up to 31st March 1936, when the last two were replaced by Mr. M. P. Kolhe, and Mian Nurullah. On the Joint Sub-Committee of the Imperial Council of Agricultural Research and of the Indian Central Cotton Committee in connection with the investigation into the cost of growing cotton, sugarcane and their rotation crops, the Committee is represented by Sir Purshotamdas Thakurdas, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. Chimanlal B. Parikh (representing the East India Cotton Association), and the Secretary. The representatives of the Committee on the Board of Governors of the Institute of Plant Industry, Indore, are the President, the Vice-President (Sir Purshotamdas Thakurdas), Mr. Chunilal B. Mehta, Mr. S. D. Saklatvala, Mr. J. Vonesch, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. Kasturbhai Lalbhai, Mian Nurullah and the Secretary. The Committee is an Associate Member of the International Federation of Master Cotton Spinners' and Manufacturers' Associations.

MEETINGS.

5. The Indian Central Cotton Committee held two meetings during the year under review, both at Bombay. The first meeting took place on the 13th and 14th January 1936, and the following were among those who attended it by invitation :—

> Sir Richard H. Jackson, Chairman, Lancashire Indian Cotton Committee, the Hon'ble Dewan Bahadur S. T. Kambli, J. P., Minister for Agriculture, Government of Bombay, the Honb'le Khan Bahadur D. B. Cooper, J.P., Member for Revenue and Finance, Government of Bombay, Mr. C. G. Freke, I.C.S., Secretary to the Government of Bombay, Finance Department, Mr. N. C. Mehta, I.C.S., Secretary, Imperial Council of Agricultural Research, Mr. N. Brodie, Director, Industrial Intelligence and Research Bureau, Indian Stores Department, Mr. W. D. M. Clarke, His Majesty's Trade Commissioner at Bombay and Mr. H. C. Short, Cotton Commissioner, Lancashire Indian Cotton Committee.

The second meeting, which was held on the 17th and 18th August 1936, was honoured by the presence of His Excellency the Hon'ble Sir Robert Duncan Bell, K.C.S.I., C.I.E. Acting Governor of Bombay. Amongst the other visitors present were Mr. C. H. Bristow, I.C.S., Private Secretary to His Excellency the Governor of Bombay, Mr. P. K. Norris, Agricultural Commissioner, U.S.A. Department of Agriculture and Mr. N. Brodie, Director, Industrial Intelligence and Research Bureau, Indian Stores Department.

A list of the more important resolutions passed at these two meetings will be found in *Appendix III.*

STAFF.

6. Mr. P. H. Rama Reddi continued to hold charge of the office of Secretary throughout the year.

The temporary gazetted post of Personal Assistant to the Secretary, held by Mr. C. J. Bocarro, was abolished during the year and a permanent gazetted post of Assistant Secretary was created to which Mr. Bocarro was appointed.

Dr. Nazir Ahmad held the post of Director of the Technological Laboratory during the year and Mr. R. D. Mihra that of Publicity Officer.

I am happy to be able to record once again my sincere appreciation of the loyal co-operation which I continued to receive during the year from every member of the office staff.

PROVINCIAL COTTON COMMITTEES.

7. The value of Provincial Cotton Committees in dealing with problems of provincial importance has been stressed in previous reports and once more the Committee records its view that where such Committees are actively functioning the work done by them has materially assisted the Committee in arriving at decisions on subjects referred to it. Local problems can be visualised in their true perspective best by Provincial Committees and therefore the discussions and the decisions of such Committees help to bridge over difficulties which the absence of the knowledge of local conditions unavoidably creates. During the year under review, the Sind and the Punjab Cotton Committees each met once and much useful work was transacted by them ; the Madras Cotton Committee dealt with the scheme for the improvement of *Mungari* cotton by correspondence without actually meeting. It is hoped that the coming years will witness a revival of the activities of Provincial Cotton Committees.

CHAPTER II.

WORK OF THE YEAR.

Cotton Policy.

8. The last Annual Report referred to the conclusions arrived at by the Committee on the investigations into the possibilities of growing cotton of long and medium staple in the present short staple cotton areas of India. Whilst these investigations were undertaken primarily as a result of the threatened Japanese boycott of Indian cotton in 1933 and the consequent growing apprehension of the serious risk India ran by depending too much on the limited market for her short stapled cotton, they have yielded information which will be of considerable value in framing the future cotton policy of the country in view of the world's present tendency towards the spinning of finer counts for which short staple cotton is unsuitable. The survey further brought to light the fact that apart from these areas which were suitable for the production of long or medium staple strains and where already the cultivation of such types was on hand, the adoption of dry-farming methods of cultivation in certain tracts would overcome the difficulties imposed on the growing of long and medium staple cotton by reason of the precarious rainfall of the tracts in question. Investigation on these lines is accordingly being undertaken in the Westerns tract of Bijapur district in the Bombay Presidency and in the Raichur and Gulbarga districts of the Hyderabad State with the aid of grants to the Imperial Council of Agricultural Research, who have already in operation dry-farming schemes in those tracts. A further step forward has been taken in connection with the improvement of *Dholleras* cotton, as during the year the Committee sanctioned a scheme having for its object the tackling of the cotton problems of the *Dholleras* tract—an extensive area to which little attention had been paid in the past. The collection of *Iran* cottons for the purpose of evolving early *herbaceum* strains suitable to some parts of the *Dholleras* tract was also set in motion during the year. The eradication of the Pink Boll-worm in the United Provinces which is expected to lead to the improvement of the quality of cotton in the United Provinces has definitely proceeded forward with the introduction of the Cotton Pest Control Bill in the United Provinces Council.

The activities of the Committee are steadily forging their way into the agricultural economy of the country and those acquainted with its history will not have failed to notice how the work of the Committee has extended and expanded in the course of years and how certain schemes of the Committee have, as through a process of natural evolution, found their counterpart in schemes of another type. For instance, the old breeding and survey and mycological schemes have developed into seed distribution and extension schemes and from entomological schemes have sprung up schemes for clean-up propaganda and schemes for popularising the use of plant pullers for up-rooting cotton stubbles.

It has been urged in some quarters that the Committee should extend its activities by including in its programme investigations on soil fertility and on improvements in the method of compost manufacture. The importance of these problems is fully realised by the Committee, but it has always held the view that work on these lines is the function of Provincial Agricultural Departments and that it is not a special problem of cotton cultivation. The study and demonstration of methods for the maintenance of soil fertility is a fundamental part of the work of Agricultural Department and they are already devoting considerable attention to it. The Committee has deliberately concentrated on problems connected with cotton in preference to that affecting all crops in all parts of the country. The Committee aims at supplementing and not supplanting the work of the Agricultural Department and so far there has been no occasion for it to deviate from this accepted principle.

COMPACT BLOCK OF LONG STAPLE COTTON IN SIND.

9. It was stated in last year's report that the Government of Bombay had, by resolution, signified their approval of the Committee's recommendation regarding the establishment of a compact block of long staple cotton of 300,000 acres in Sind and had expressed their concurrence with the conclusion arrived at by the Chief Agricultural Officer in Sind that the area south of the Jodhpur Railway was the most suitable for such purpose. During the year under review, the Cotton Ginning and Pressing Factories (Bombay Amendment) Act, 1936, which provides for the licensing of gins and presses, was passed into law and was made applicable in the first instance to the province of Sind, with effect from such date as the Local Government may, by notification, appoint. Owing to certain difficulties which subsequently arose, the issue of the notification has, however, been delayed. The Act has for its object the prevention of malpractices arising from the watering, mixing or admixture of cotton and the desirability of the early application of the Act to Sind, where the malpractices referred to are non-existent or only in their incipient stage, led the Committee at its meeting in August 1936, to pass a resolution urging on the Government of Sind the necessity of taking very early steps to make the Cotton Ginning and Pressing Factories (Bombay Amendment) Act effective in that province by framing rules as early as possible before malpractices became established in the newly developed cotton tracts. With regard to the reservation of compact block for the growing of superior varieties of cotton, the Bombay Government have declared that in accordance with the policy of the Agricultural Department in Sind the seed of the improved varieties 289*F* and 289*F* (1) only will be distributed in this area. In the opinion of the Local Government the application of the Cotton Transport Act to the proposed block in order to prevent the importation of *kapas* from outside the area for purposes of mixing presents practical difficulties. They consider that the absence of natural boundaries around the cotton growing areas and the lack of regular routes of communications in Sind would make the enforcement of the Act both costly and difficult. Should, however, experience

indicate at a later stage of development of the area that it is desirable to prohibit the import from the Punjab by rail of inferior seeds into Sind for sowing purposes, necessary action will be taken. It is felt, however, that such action would be possible only when an adequate supply of the seed of the varieties 289*F* and 289*F*(1) are available for the tract—a condition which, it is estimated, would take two years to fulfil.

SPREAD OF GARROW-HILL COTTON IN THE CENTRAL PROVINCES.

10. The recommendation of the Central Provinces Provincial Cotton Committee, which was endorsed by the Committee last year for the adoption of legislative measures for the eradication, from the Central Provinces and Berar, of *Garrow-Hill* cotton, a very inferior short staple but prolific variety, which has lowered the reputation of even the superior types of cotton in the tract, was accepted by the Central Provinces Government. A Bill* for the prohibition of the cultivation of *Garrow-Hill* cotton in the Central Provinces was introduced in the Central Provinces Legislative Council and has been referred to a Select Committee.

BOMBAY COTTON CONTROL ACT.

11. As foreshadowed in last year's report, the Bombay Government introduced in the Legislative Council in September 1935, the Bombay Cotton Control Bill, having for its object the prohibition of the cultivation, mixing or possession of *Goghari*, an inferior type of cotton which was spreading to an alarming extent in the Surat tract and threatening the reputation of 1027 *A.L.F.* to the detriment of the cotton growers of Surat. With commendable expedition the Bill passed into law in November 1935. The Committee is confident that this piece of legislation will go a long way towards improving the quality of cotton of the Surat tract and that the benefits to the grower expected from the Act will soon be realised. A copy of the Act will be found in *Appendix V*.

As *Goghari* was spreading also in the Baroda State whose territory is interlaced with the Bombay Gujerat, the Durbar, by notification, applied the provisions of the Bombay Cotton Control Act, with slight modifications, to the State.

LANCASHIRE INDIAN COTTON COMMITTEE.

12. The work of the Lancashire Indian Cotton Committee as recorded in its 2nd Annual Report evoked the commendation of the Indian Central Cotton Committee at its meeting in August 1936, when the report was considered. Whilst expressing its satisfaction that through the sustained efforts of the Lancashire Committee the takings of Indian cotton by Lancashire exceeded 500,000 bales, the Committee could not avoid the feeling that a considerable field still existed for the more extended use of Indian cotton in the United Kingdom. On the basis of a production of yarns up to 20's counts only, it has been roughly computed that Lancashire's

* This Bill has since become law.

requirements of raw cotton amount to 1,363,000 bales and for much of this Indian cotton is suitable. Even allowing for the fact that Lancashire mills employ a certain quantity of waste and long staple cotton in the production of yarns up to 20's the gap between " potential consumption " and " present achievement " is still far too wide and until this gap is considerably reduced, the position cannot be viewed with equanimity from the Indian standpoint. The Committee is not unmindful of the existence of factors which militate against the adoption in manufacture of a class of cotton not previously employed and of possible prejudices to be overcome anterior to such employment, but it is confident that with the judicious use of the weapon of propaganda, which has already proved to be effective, reinforced with the experience of the past, the aspect of the problem will be changed in the not distant future. The large increase in the takings of Indian cotton in the last three years is a striking testimony to the efficiency of the organisation and propaganda of the Lancashire Indian Cotton Committee. It has been suggested to the Lancashire Indian Cotton Committee that one direction in which the use of Indian cotton in the United Kingdom could be furthered was by approaching the subsidiary industries like the woollen, belting, gun cotton and explosives, motor car, etc., which consume a certain quantity of cotton in the manufacture of various articles, and by impressing upon them the desirability of using Indian cotton in preference to foreign growths. The Lancashire Indian Cotton Committee is fully assured of the goodwill and co-operation of the Indian Central Cotton Committee in the mutual aim of the two bodies for the more extended use of Indian cotton in the United Kingdom.

The following figures of consumption of Indian cotton by, and the imports of Indian cotton into, the United Kingdom are very illuminating in regard to the achievements of the Lancashire Indian Cotton Committee and the progress made by Indian cotton in Great Britain :—

Year (August 1 to July 31).	Lancashire Indian Cotton Committee.	Liverpool Cotton Association.	Depart. of Com. Intelligence & Statistics, Calcutta.	* Total exports to all countries.
	Millions of lbs. (Consumption)	*Thousands of bales (Running)* (Imports into U. K.)	Exports to U.K. (*Thousands of bales of 400 lbs.*)	
1928–29	72	228	233	3,933
1929–30	73	291	286	3,868
1930–31	98	281	274	3,729
1931–32	72	137	128	1,592
1932–33	49	230	257	2,868
1933–34	92	362	367	3,270
1934–35	133	394	374	3,115
1935–36	Figures not available.	547	533	3,826

* From 1931-32 exports from Kathiwar Ports are included.

THE COTTON TRANSPORT ACT.

13. At the request of the Indian Central Cotton Committee the Government of India passed in 1923 the Cotton Transport Act, which enables local Governments to prohibit the import for purposes of mixing and substitution of inferior cotton into areas growing superior varieties within their jurisdiction.

Madras.—There was no change in the protected areas in the Madras Presidency.

Bombay.—Only one of the seven protected areas notified in the Bombay Presidency changed during the year under report. It was stated in the last year's report that the Committee approved of a proposal of the Director of Agriculture, Bombay Presidency, to fix the Mahi river as the northern boundary of the Nerbudda-Mahi protected area. The Local Government have since accepted this proposal and have notified the change accordingly.

Central Provinces.—During the year the Narsinghpur Sub-Division was included in the protected area with the object of preventing the import of *Bengals* cotton into the province for the purpose of mixing.

Indian States.—There was no change in the protected areas in Hyderabad, Indore, Sangli, Rajpipla and Chotta Udepur which are the only Indian States that have such legislation in force.

THE COTTON GINNING AND PRESSING FACTORIES ACT.

14. During the year under report nearly a score of cases of infringement of the Act were brought to the notice of the authorities concerned. In some cases either the wrong year or indecipherable or incorrect marks were put on bales, while in one or two cases press marks were absent. In almost all cases the factory owners were warned; in only one case in the United Provinces a fine of Rs. 25 was imposed on a factory owner. In cases where breaches were due to misunderstanding of the procedure, instructions as to the proper method of marking bales were issued to factory owners and they were directed to be more careful in future. In one case regarding the issue of bales with incorrect marks a District Magistrate held the view that an arbitration award of the East India Cotton Association was inadmissible in evidence in Law unless it was proved by the evidence of the arbitrator and the survey clerk and considered that the production of this evidence would involve Government in much greater expense than the amount to be realised from fines. The East India Cotton Association, to whom the matter was referred, held that if this attitude were adopted the Act would remain a dead letter and they suggested that the difficulty and expense of producing evidence could be got over by issuing a commission to Bombay to take the evidence of the seller, one of the arbitrators and the survey clerk.

Mention was made in last year's report of the warning given by a Collector to a factory owner for the use of unauthorised weights in the factory and of the fact that the attention of the Local Government was drawn to the leniency of the punishment. The Local Government concerned issued a circular to all District Magistrates instructing them to institute prompt proceedings against factory owners caught using unauthorised scales or weights as such practices involved loss to the illiterate cultivator.

Most cotton producing Indian States have fallen into line with British India in legislating for the purpose of the marking of bales and the submission of weekly returns of cotton pressed. During the year, the Maliya and Khairpur States introduced similar legislation, thus bringing the total to 67. Out of these weekly press returns were received from sixty, Gwalior being amongst those from whom such returns were not received.

LICENSING OF GINNING AND PRESSING FACTORIES.

15. It is gratifying to record that one of the first pieces of legislation advocated by the Committee almost since its inception has at last found a place in the statute book of the Bombay and Central Provinces Governments. This step was taken as the result of the decision of the Government of India not to undertake legislation themselves for the licensing of ginning and pressing factories but to leave it to local Governments to do so if they desired. Acts amending the Cotton Ginning and Pressing Factories Act were passed by the two Local Governments mentioned making it obligatory on all cotton ginning and pressing factories situated in areas to which the Act may be applied to take out licenses, and prohibiting watering, mixing or admixtures of cotton. It is the belief of the Committee that these measures will go a long way in suppressing the malpractices which are detrimental to the interests of the cotton grower as they mar the fair name of Indian cotton both in India and abroad. Although the Bombay Act has, in the first instance, been made applicable to Sind —now a separate province—it will not, as originally hoped, be in operation during the revenue year 1936-37, as the Sind Government have not been able to pass the necessary rules under the Act before the commencement of the cotton season. The Bombay Government have under contemplation the application of the Act to other parts of the Presidency. Owing to the enactment of similar legislation by the Central Provinces Government, the Indian Central Cotton Committee, at its meeting in August 1935, passed a resolution urging on the Bombay Government to apply the Act to the Khandesh tract of the Bombay Presidency. The Central Provinces Act extends to the whole of the province and will be in operation as soon as the required rules which are under the consideration of the Local Government have been framed. Copies of the Bombay and Central Provinces Amendment Acts will be found in *Appendices VI and VII.* The Punjab Government have also under consideration the introduction of a similar measure, the chief problem there being the mixing of cotton. Among Indian States, Hyderabad has been a pioneer in the field of legislation of this type, the licensing of cotton ginning and pressing factories being in operation there from 1931.

MALPRACTICES.

16. The East India Cotton Association reported five cases of bales having been rejected or awarded " off " allowance on account of the cotton being heavily watered. These bales were from Navsari and Shendurni (East Khandesh), in the Bombay Presidency, Viridhunagar in the Madras Presidency, and Mandi Dabwali in the Punjab. Certified copies of entries in the press registers pertaining to the bales in question were called for under Section 3(3) of the Cotton Ginning and Pressing Factories Act and the information received was passed on to the East India Cotton Association.

An exporting firm in Bombay reported that two lots of 48 and 41 bales each of cotton purchased by them were found to be heavily watered. As the press marks showed that the bales came from Arvi, a certified copy of the entry in the press register relating to the bales in question was called for and the information was supplied to the firm concerned.

Complaints were received from Japan to the effect that full pressed bales were being opened in Bombay and after being fraudulently mixed with inferior cotton were repressed and exported to Japan. The East India Cotton Association, which had also received similar complaints, had replied pointing out that as Bombay grew no cotton, bales pressed in Bombay would indicate by their very name that the cotton was mixed and that as exporters purchasing such cotton had ample opportunities to inspect the cotton such bales could not be described as " false packed." In view of the reply sent by the East India Cotton Association the Committee considered that no further action was necessary and the attention of the complainants was merely drawn to the reply of the Association.

Complaints were also received from the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester, about the presence of foreign matter in Indian cotton. The Committee felt, however, that a general condemnation of the ginning of Indian cotton was not helpful towards a solution of the question and also that the complaints themselves were greatly exaggerated. The Federation were informed that the Committee fully realised the importance of exporting cotton in such a condition as not to give room for any complaint though actually the number of complaints reported was very small in comparison with the size of the Indian cotton crop. In its opinion, Indian cotton was far more even running and free from foreign matter than any other growths and improvement was already taking place as a result of better supervision. Steps could only be taken to improve the present position if foreign spinners reported the press marks and serial numbers of bales containing badly ginned cotton. Intimation was subsequently received that the reply of the Committee was fully discussed by the International Cotton Committee at its meeting in April 1936, and it was admitted that the Indian Central Cotton Committee was doing its best to eliminate the cause of spinners' complaints in East Indian cotton.

A complaint from one of the members of the Committee regarding the unsatisfactory ginning and pressing of *Punjab-American* cotton was reported to the Director of Agriculture, Punjab, who issued a circular to all owners of ginning and pressing factories asking them to take steps to avoid the recurrence of such complaints and to take necessary precautions to raise the standard of the ginning and pressing of cotton.

A reference from the Hyderabad State, regarding the presence of excessive seed in pressed bales of cotton, was forwarded for an expression of opinion to the East India Cotton Association who suggested in reply the installation in ginning factories of special sieves about four feet square, made either of baling hoops or expanded metal, whereby the cotton would be caught up and the seed which accidentally got mixed with the cotton would drop through the sieves. This suggestion was passed on to H. E. H. the Nizam's Government.

As a result of reports received during the year that mill fly, droppings, cotton waste, and even old crop cotton were being mixed with good cotton in Khandesh, the matter was brought to the notice of the Bombay Government with the object of their taking steps under the Cotton Ginning and Pressing Factories (Bombay Amendment) Act, for the effective prevention of this malpractice. In their reply the Bombay Government expressed their intention of awaiting the results of the propaganda work which the Agricultural Department was carrying on against the practice in question before taking action in the matter.

In connection with the mixing of cotton waste with good cotton, it was noticed that cotton waste was being brought to the Dhulia cotton market in increasing quantities and as most of it was used for mixing with good cotton, a reference on the subject was made to the Chairman of the Dhulia Cotton Market Committee. He reported that the entry of cotton waste into the market could not legally be prevented, since dealings in cotton waste were recognised under the Bombay Cotton Markets Rules; he, however, considered that the only remedy for preventing the mixing of fly, mill-dropping and cotton waste with good cotton was the application of the Cotton Ginning and Pressing Factories (Bombay Amendment) Act, to the whole of the Khandesh tract and the amendment of the definition of "cotton" so as to exclude from it "cotton waste" and "mill droppings," which should be brought under the category of foreign substance.

The Committee at its meeting in August 1936 passed a resolution requesting the Government of Bombay to extend the Cotton Ginning and Pressing Factories (Bombay Amendment) Act to East and West Khandesh, and other tracts of the Bombay Presidency, particularly in view of the fact that the Central Provinces Government had already passed similar legislation. The resolution also drew the attention of the Government of Bombay to the fact that the Bombay Act as at present worded did not

prevent the mixing of cotton waste with cotton and requested them to take in hand the necessary amendment for this purpose.

The presence of seed and impurities in full pressed bales from various places in the Punjab and the Patiala State continued to be the subject of complaints. The Director of Agriculture, Punjab, was requested to bring the complaints to the notice of factory-owners concerned in the Province and to impress on them that such malpractices lowered the reputation of the cotton of the tract and adversely affected the interests of the trade and the cultivators. Action as suggested was accordingly taken. As regards the complaints from the Patiala State, the attention of the State authorities was drawn to the careless manner in which ginning was done and to the existence of admixtures of seed in Patiala cotton. Intimation was subsequently received to the effect that steps were being taken to put a stop to the malpractice complained of and that a warning had been issued to the factory-owners.

At the suggestion of a cotton exporting firm in Karachi, the Karachi Cotton Association was addressed regarding the desirability of circularising during the coming season those presses which in the past season had pressed cotton containing impurities informing them that the press marks of presses found indulging in malpractices would be posted at the rooms of the Karachi Cotton Association and also that copies of such postings would be sent to the East India Cotton Association, Bombay, for taking similar action. The Karachi Cotton Association decided to address the factories concerned first in a friendly way and to await the result of the propaganda carried on before taking action on the lines suggested.

In the absence of legislation for the suppression of malpractices, a suggestion was made to the East India Cotton Association, that they should tackle the problem by imposing penalties and issuing, if necessary, instructions to its surveyors and arbitrators to be more strict in their awards. In their reply the Association stated that the question of taking effective measures against watering would be considered by the Board after the results of tests on the moisture content of cotton become available. As regards false packing, the Association had under consideration the question whether cotton containing excessive seed and/or crushed seed should be rejected by the award of sufficient " off " allowances irrespective of other characteristics of the cotton.

COTTON MARKETS.

17. In the Bombay Presidency, a cotton market was established at Dhulia in 1930, another at Amalner in 1934 and a third at Bailhongal in 1935. During the year under report no appreciable progress was made in the establishment of regulated cotton markets though Bombay Government expressed themselves as being in favour of establishing regulated cotton markets at Broach and Bijapur and at Bavla in the Ahmedabad District.

In the Central Provinces two regulated cotton markets have been in existence under their Act which was passed in 1932—one at Warora and another at Chanda. The reasons given for the non-establishment of a larger number of regulated markets were (1) the apathy or active opposition of local bodies, in whose hands lay the initiative of applying for their establishment, for fear of losing power, (2) the reduction of the income from cotton markets owing to the failure of the cotton crop for four consecutive years and (3) the small volume of cotton marketted in some places which did not justify the formation of a separate market for cotton. The Central Provinces Legislative Council passed during the year under report a law empowering the Local Government to establish regulated cotton markets even without the consent of the local bodies concerned. It is hoped that this measure will lead to the more rapid establishment of regulated cotton markets. The Municipalities of Wardha and Hinganghat have already applied for the issue of the necessary notification making the Act applicable to the markets at those stations. The Local Government have under contemplation the application of the Central Provinces Act to Berar also and the repeal of the separate Act in force there.

In the Madras Presidency, there is only one regulated market—at Tiruppur in the Coimbatore District—established under the provisions of the Madras Commercial Crops Markets Act, 1933. During the year two amending Acts to the Madras Commercial Crops Markets Act were passed, the first of which empowers the Government to nominate all the members of Market Committees when a Market Committee is to be established for the first time ; this ensures that no time is lost in connection with the elections before a Market Committee is brought into existence. The original Act required that out of the twelve members constituting the Market Committee, two should be nominated by Government and the rest elected. This amendment further confers on the Local Government the power to alter the limits of the notified area. The second amendment makes it obligatory on all ginning and pressing factory owners to take out licenses to enable them to carry on their business for the sale and purchase of cotton. This Act further provides for dealing with the continued absence of members of Market Committees.

The Punjab Government are for the present not in favour of the establishment of regulated cotton markets.

In Sangli State the original Huzur Order regulating the sale and purchase of commercial crops in the State continued to be in force.

In the Baroda State, the framing of rules under the Baroda Agricultural Produce Markets Act, referred to in previous reports, is still under contemplation.

In Hyderabad State there are several cotton markets to which the Hyderabad Agricultural Markets Act has been applied.

UNIVERSAL STANDARDS FOR INDIAN COTTONS IN INDIA.

18. In accordance with the Committee's decision the Standards Sub-Committee passed during the year under report the universal standards in India for the following varieties of cotton :—

Bengals	*Sind-American*	*Mathias.*
Sind.	*Kumptas.*	*Broach.*
Punjab-American.	*Oomras.*	*Dholleras.*

The reference standards of the Committee were stored at Bangalore in hermetically sealed zinc cases and on being compared at the time of the preparation of the current season's standards with the duplicate set stored at Sewri in the ordinary way, they were found to be about half a grade better in colour. The Standards Sub-Committee accordingly decided that in future the Sewri sets also should be preserved in hermetically sealed zinc cases with a view to finding out to what extent the variation in colour was attributable to difference in climate between the two places of storage. It might perhaps not be without interest to record here the reasons which led the Committee to move in the direction of establishing universal standards for Indian cotton and the extent to which its objective has been accomplished. Prior to 1933 there were two separate bodies in India which prepared standards for Indian cotton, *viz.*, the East India Cotton Association and the Karachi Cotton Association ; the latter Association prepared standards for *Bengals*, *Sind*, *Punjab-American* and *Sind-American* cottons only whilst the former had, in addition to standards for the first three varieties of the cottons mentioned, standards for other varieties of Indian cotton also. It was observed that the standards of the cottons dealt with by the two Associations differed from each other and as this resulted in certain amount of competition between the two markets which was likely to be detrimental to the interests of the cotton trade as a whole, it was considered desirable to adopt standards which would be of universal application throughout the country. It was also felt that the Indian Central Cotton Committee was the body best fitted to take the initiative in this matter and as a result of the Committee's intervention standards common both to the Bombay and Karachi cotton markets were prepared for the first time in 1934. Whilst it is too early to expect any appreciable trading in these Universal standards, it is noteworthy that the Karachi Cotton Association have decided to accept the Universal Standards of the Committee as the basis for the Karachi standards, and that the Standards Committee of the East India Cotton Association have recommended to the Board of Directors of the Association that the Universal Standards should be adopted as the basis for the preparation of the official standards of the Association. Thus in respect of the varieties of cotton dealt with by both the Associations, the standards for them will be common in all but name.

REPRESENTATION ON THE INTERNATIONAL FEDERATION OF MASTER COTTON SPINNERS' AND MANUFACTURERS' ASSOCIATIONS.

19. Mention was made in last year's report that in order to deal more effectively with complaints arising abroad regarding faults, often of a minor nature, in Indian cotton which frequently received wide publicity through the publication of the proceedings of the bodies at which they were discussed, the Committee considered it desirable to obtain, if possible, representation on the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester. The Committee has since been admitted as an Associate Member of the Associations and this will ensure the proper presentation of the position in India, both by the Committee or its duly appointed representatives, whenever cases relating to Indian cotton come up for discussion at meetings of the Federation.

THE UNITED PROVINCES COTTON PEST CONTROL BILL.

20. The cotton crop of the United Provinces is subject to attack by the Pink Bollworm and it is calculated that upwards of 25 per cent. of the crop of this province in normal years and nearly 50 per cent. in some years is destroyed by this insect pest. The normal loss to the cultivator is estimated at Rs. 10 to Rs. 15 per acre. As a result of continued research between 1923 and 1931 financed by the Committee, it has been ascertained that the treatment of all cotton seed by heating to an appropriate temperature kills the hibernating larvae and diminishes the attacks of this pest with consequent increase in yield and income. To reduce its depredations the United Provinces Government have accordingly introduced in the local legislature the United Provinces Cotton Pest Control Bill,* which provides for all cotton seed in the notified area to be subjected to heat treatment before being sown. With the passing of this piece of legislation, the cultivators within the sphere of its operation will reap the higher profits which the investigation has shown to be possible as the result of the heat treatment of seed which destroys the Pink Boll-worm larvæ. This legislation may be regarded not only as the culmination of a long period of successful research work but also as the first essential for one of the most important items of future progress *viz.*, the growing of long staple cotton in the United Provinces.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

21. *The Mexican Boll-weevil* (*Anthonomus grandis*).—The restrictions placed by the Government of India in 1925 on the import of American cotton into India with a view to prevent the introduction of the Mexican Boll-weevil continued in force, without change, during the year under review. Under these regulations American cotton can be imported into

* The Bill has since been passed into Law (*Appendix VIII*).

India only through the port of Bombay and after fumigation with hydrocyanic acid gas on payment of the prescribed fees. Imports of American cotton declined to 21,121 bales during the year from 63,171 bales in the preceding year. During the year the Government of India at the request of the Committee made permanent the reduced fees of Rs. 2-7 per square bale and of Re. 1-8 per round bale of American cotton.

The Red (Sudan) Boll-worm (Diparopsis castanea) and other pests.— The entire prohibition of the import of foreign *kapas* (unginned cotton) under Government of India Notification No. 897-Agri., dated the 24th July 1925, and the restrictions placed on the import of foreign cotton seed under Notification No. 1213-Agri., dated the 27th May 1930, of the Government of India in the Department of Education, Health and Lands remained in force throughout the year. Under the 1930 Notification 10 parcels of cotton seed were received, examined, and where necessary, fumigated, during the year.

COLLECTION AND SUPPLY OF INFORMATION.

22. As usual, notes* on the progress in the Provinces and Indian States in the introduction of improved varieties of cotton and on the work of the Committee were supplied to the East India Cotton Association and the Karachi Cotton Association for publication. The weekly statements of purchases and arrivals of American cotton were published as usual for general information. The names of ginning and pressing factories in Indian States with the requisite details regarding press marks, name of owner or occupier, etc., were obtained and communicated to the Director General of Commercial Intelligence and Statistics, Calcutta, for publication in the *Indian Trade Journal* and for incorporation in the list of Cotton Ginning and Pressing Factories published by that Department.

PUBLICITY AND PROPAGANDA.

23. The Annual Report of the Publicity Officer, which forms Chapter VII of this Report, gives a full account of the activities of the Publicity and Propaganda Department of the Committee.

The most important event of the year was the drive initiated by the Bombay Department of Agriculture, with the Committee's co-operation to eliminate the inferior type of cotton known as *Goghari* from the Surat tract. The anti-*Goghari* poster "Get rid of the weight," placards, etc., were used with much advantage during the campaign. Only partial success, however, attended these efforts as owing to its higher ginning percentage, *Goghari* was mixed with Surat 1027*A.L.F.* and the mixture was passed off as genuine *Navsari*. In order to put a stop to this malpractice, legislation

* *Appendix IX.*

was introduced in the Bombay Council and passed* prohibiting in any notified area the cultivation of *Goghari* cotton, its mixture with any other cotton and the possession, use or trade in such cotton either alone or mixed with other cotton.

Fifteen press *communiqués* were issued, two of which dealt with the development of cotton growing in Sind and the Bombay Presidency and one with the improvement of cotton in India.

Besides the special articles and pamphlets issued from time to time the Department also participated in the Rural Life Exhibition at Baroda, organised in celebration of the Diamond Jubilee of H. H. the Maharaja of Baroda, the All-India Industrial Exhibition, Delhi, the Fair in Rajputana, the Crop Demonstration at Amraoti and Yeotmal and the Fair and Demonstration at Warora in the Central Provinces.

PUBLICATIONS.

24. The Committee receives partly by subscription and partly on an exchange basis a number of important scientific and technical journals which are circulated to research workers under the Committee. This arrangement not only effects economy but also affords to the Committee's research workers an opportunity of perusing varied and up-to-date scientific literature which otherwise would not ordinarily be available to them.

The Committee desires to express its indebtedness to those institutions on whose free mailing list its name has been placed. Particular mention may be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, the Empire Cotton Growing Corporation, the British Cotton Growing Association, the East India Cotton Association and the Karachi Cotton Association for the supply of their publications for distribution to members. The Committee has also to record its thanks to the Indian Trade Commissioner, London, the U.S.A. Department of Agriculture, the Egyptian Ministry of Agriculture, Technical and Scientific Service, the Liverpool Cotton Association, the Lancashire Indian Cotton Committee, the Imperial Bureau of Plant Genetics, Cambridge, the Textile Institute, Manchester, the Imperial Institute, London, the Indian Statistical Institute, Calcutta, the National Institute of Sciences, Calcutta, the Academy of Sciences and other Associations and Chambers of Commerce for supplying it with reports, statistics and other literature from time to time. The Committee is also on the free exchange list of the Imperial Council of Agricultural Research, the Imperial Institute of Agricultural Research, Delhi, and the Director-General of Commercial Intelligence and Statistics, Calcutta.

* *Appendix V.*

SECRETARY'S TOURS.

25. The places visited by Secretary between the 1st September 1935 and the 31st August 1936, in connection with the work of the Committee were :—

Mirpurkhas, Oderolal, Sakrand, Sukkur, Lloyd Barrage, Almani Johi and Dadu in Sind ; Parbhani, Nandapur, Nanded, Latur, Chikurda, Ardhapur, Hadgaon, Basar and Madhol in the Hyderabad State ; Coimbatore, Perundurai, Tiruppur and Ootacamund in the Madras Presidency and Indore and Delhi.

FINANCIAL.

26. In *Appendix X* will be found a statement showing the Receipts and Expenditure of the Committee and also the Balance Sheet for the year ending 31st March 1936. Receipts amounted to Rs. 10,12,740, and expenditure to Rs. 11,40,629.

With the separation of Burma from India under the new constitution, the cess hitherto collected from that Province will no more be available to the Committee ; this loss, however, will to some extent be compensated for the fact that the Committee will not be called upon to sponsor cotton schemes in that Province after separation.

CHAPTER III.

STATISTICS.

27. Cotton being one of the principal money crops of the Indian agriculturist and cotton manufacture one of the most important industries of the country, it is inevitable that the Committee should devote much of its attention to the improvement, preparation and publication of cotton statistics. The following paragraphs deal with the work done under this head during the year.

28. *Cotton Crop Estimates.*—As usual cotton crop estimates were wired by the Director General of Commercial Intelligence and Statistics, Calcutta, to the Secretary, Indian Central Cotton Committee with a view to their simultaneous publication at Bombay and Calcutta. This arrangement has now been in force for the last six years and from the trade point of view its institution has been amply justified.

A comparison with the previous year's figures shows that the area under cotton in India increased from 24,023,000 to 25,138,000 acres, the highest since 1929-30 when it was 25,922,000 acres. The firm price level for cotton in the preceding year coupled with the comparatively favourable sowing conditions in the cotton growing tracts partly contributed to the increased acreage. The total estimated yield for 1935-36 was 5,728,000 bales of 400 lbs. each, as against 4,858,000 bales for 1934-35, the yield being nearly as high as that in 1928-29 when it touched 5,782,000 bales of 400 lbs. each. Favourable weather conditions during the season under report were responsible for the improvement in the average yield per acre which was 91 lbs. in 1935-36, against 81 lbs. in the preceding year, the highest average in the last decade being 96 in the year 1927-28.

The fillip to cotton cultivation in India given by the opening of the Sukkur Barrage and Canal systems in 1932 is demonstrated by the fact that during the year under report the cotton area in Sind touched the record figure of 844,000 acres, as against the ten year average of 321,000 acres during the pre-barrage period. Of the acreage for 1935-36, 385,000 acres were under long and medium staple American strains.

29. *Improvement of Cotton Forecasts.*—A practical step towards tackling the problem of improving the accuracy of the cotton forecasts of India was taken by the Committee in 1934 when it sanctioned a scheme for the improvement of the cotton forecasts of the Bombay Presidency and Sind (including Indian States), for two years at an estimated cost of Rs. 11,694. The object of the scheme, which incidentally embraces roughly one-fourth of the area under cotton in India, is to probe into the sources of the inaccuracies in the different factors used in the computation of the forecasts and to suggest measures for their rectification. As the sanctioned period of two years was found to be insufficient to cover the entire field, the scheme

was extended by three years up to 15th June 1939, at an additional cost of Rs. 16,500. During the year under report a recurring error which was rectified was found to be the adoption in the forecast estimates of several Indian States in the Bombay Presidency of a standard for a normal crop in terms of *annawari* different from that in vogue in British India. Further, in the absence of standard yield figures for some Indian States, those for adjoining British districts have been followed and this procedure was found to constitute a source of error in the cotton forecasts of some of the States. With a view therefore to formulate independent standard yield figures to replace those now used efforts were made to obtain actual yield figures and other relevant data for some of the States over a series of years. As regards the Deccan (excluding Khandesh), an examination of the available statistics revealed the desirability of adopting separate standard yield figures for cotton in irrigated and non-irrigated areas, and it is accordingly proposed to prepare the forecasts of 1936-37, on this basis.

One of the factors adversely affecting the accuracy of Government cotton forecasts in India is the lack of exact information regarding the quantity of *kapas* (seed cotton) and loose (ginned but unpressed) cotton which is consumed chiefly in villages for such domestic purposes as hand-spinning, making of quilts, mattresses, cordage, etc.; such extra-factory consumption is roughly estimated at 750,000 bales for the whole of India. To arrive at a more reliable estimate of the extra-factory consumption, local enquiries were conducted in typical localities in different provinces and States with the aid of funds provided by the Indian Central Cotton Committee. Until all the reports are received and considered it is too early to say whether any alteration in the conventional estimate of 750,000 bales for extra-factory consumption can be recommended or whether further investigations will be necessary before a final decision is arrived at.

As a result of the *post-mortem* examination of the cotton forecasts of each season, the subject of the improvement of the cotton forecast is engaging the close attention of the authorities concerned to whom a forum for the exchange of views and discussion of common problems is afforded by the half-yearly meetings of the Cotton Forecast Improvement Sub-Committee. As a result of the critical examination of the sources of error in the cotton forecasts of past seasons tentative revised standard yield figures have been adopted for Sind and for parts of the Bombay Presidency. Crop-cutting experiments now under way in the British districts of the Punjab on a more extensive scale than before will, it is hoped, provide a more reliable basis for fixing the standard yield figures, while the institution in the Central Provinces and Berar of weekly ginning returns with effect from the season of 1935-36 has brought the problem of improving the accuracy of the cotton forecasts of that province nearer solution. In view of the under-estimation noticed in the cotton forecasts of the Mysore State in the past seasons, proposals for conducting crop-cutting experiments during 1936-37 to arrive at more accurate standard yield figures are under consideration by the State.

30. *Staple Length of the Indian Cotton Crop.*—As usual a report on the estimated production during the season of Indian cotton of different staple lengths was issued in May. At the suggestion of the trade, which was accepted by the Committee, trade estimates were for the first time in this respect shown side by side with Government estimates. Whilst it is realised that the reconciliation of the Government with the trade estimates is not unattended with difficulty as the basis under which the two estimates are prepared are dissimilar, its bearing on the problem of the accuracy of the Government cotton forecasts warrants its examination. The Committee warmly acknowledges the assistance which it has received from the trade in this connection.

31. *Press Statistics.*—Since 1925, weekly returns of cotton pressed in British India have been collated by Provincial authorities under the Indian Cotton Ginning and Pressing Factories Act, 1925, and forwarded to the Director-General of Commercial Intelligence and Statistics for publication. To make the statistics of cotton pressed complete for the whole of India, the co-operation of Indian States in compiling and supplying similar figures for the States was enlisted and it is gratifying to record that all the sixty-seven States addressed have responded either by introducing legislation or passing the necessary executive orders. The expectation referred to in the previous year's report that press returns for the Gwalior State would be available from 1935-36 has unfortunately not materialised owing to certain administrative difficulties, which, however, have since been overcome and it is hoped that the returns will be available from the 1936-37 season.

During the season 1935-36, 4,321,364 bales were pressed in British India and 1,623,169 bales in Indian States making a total of 5,944,533 bales for the whole of India, the corresponding figures for the preceding season being 3,444,875, 1,166,938 and 4,611,813 bales, respectively.

32. *Loose (Unpressed) Cotton Statistics.*—The statistics of cotton pressed referred to in the preceding paragraph do not account for the whole of the Indian cotton crop, as, besides the cotton utilised for village or extra-factory consumption chiefly in the form of *kapas*, for which as explained elsewhere efforts are being made to obtain a more reliable estimate, mills situated in the heart of cotton growing areas use considerable quantities of loose (ginned but unpressed) cotton. To account for this, the statistics of loose cotton received at mills in the major cotton growing provinces have therefore been obtained on a voluntary basis since 1926 and published. In 1935-36, 264,000 bales of loose cotton were received at mills in the major cotton growing provinces of British India. The relevant figures for 1926-27 to 1935-36 are shown in *Appendix XI* to this report.

During the year under report, the Government of India, on the recommendation of the Committee, amended the form of monthly returns required to be submitted by mills under the Indian Cotton Cess Act, as a result of which the quantities of pressed and unpressed cotton consumed

in mills have now to be shown separately in the prescribed returns. The Indian States concerned have also extended their co-operation by instructing the mills within their jurisdiction to furnish the information supplied voluntarily by them classified in a similar manner. The figures for unpressed cotton consumed in mills collected largely under statute will now ensure the publication of more accurate and complete information for the whole of India.

33. *Consumption.*—As in the past, figures for the consumption of Indian cotton in mills in British India and Indian States were published monthly. The season's total consumption of Indian cotton in mills in India amounted to 2,677,572 bales of 400 lbs. net and established a new record, breaking the previous year's record figure of 2,612,132 bales (*vide Appendix XI*). Compared with last year, the consumption of cotton in the Bombay Presidency showed a decline whilst Indian States, the United Provinces, the Central Provinces and the Madras Presidency all registered increases.

According to the figures published by the International Federation of Master Cotton Spinners' and Manufacturers' Associations the world's total mill consumption of Indian cotton, exclusive of Germany and Italy (for which figures are not available), showed a slight decrease from 5,414,000 bales during the year ending 31st July 1935 to 5,393,000 bales during the corresponding period of 1935-36.

34. *Exports.*—The exports of Indian cotton during the season totalled 3,826,000 bales of 400 lbs. each against 3,115,000 bales in the previous year.

35. *Stocks.*—Up to 1933 reliable estimates of the stocks of Indian cotton held in mills and at trade centres in India on 31st August were not available except for the Island of Bombay. In view of the value of these figures to the trade as well as to the authorities in the Provinces and States responsible for preparing and checking the cotton forecasts, the Committee has been endeavouring since 1933 to collect the desired information on a voluntary basis through the co-operation of mills, trade associations, Cotton Market Committees and other official sources. Though the problem is not an easy one due to its wide ramifications, considerable headway has been made, and in course of time with an increasing realisation of the usefulness of these statistics, it is hoped, accurate and complete figures will become available.

The information collected in respect of the stocks held on the 31st August 1936, is contained in *Appendix XII.*

As regards the very late crops, *viz.*, *Salems*, *Cambodias* and *Tinnevellies* of the Madras Presidency, the season for which is taken to be the year ending 31st January, the Director of Agriculture, Madras, has made arrangements to collect every year the stocks held on 31st January, by the trade in the respective tracts and by mills in the whole of the Presidency. The figures for the 31st January 1935 and 1936 are given in *Appendix XII.*

36. *Demand for various types of Indian Cotton.*—Statistics of the export and Indian mill demand for the various types of Indian cotton are of considerable importance to those on whom falls the task of directing and shaping the cotton policy of India and the Committee has, therefore, for some time past, been collecting the relevant data through direct enquiries on a voluntary basis. Further, to enable the grower to realise the best value for his cotton, it is essential that he should grow those types for which the demand is keen and these statistics therefore serve as a guide to him. The tables in Statistical Leaflets Nos. 3 and 4, Third Issues (1935-36), giving the results of the inquiry carried out in respect of exports and receipts at mills during 1935-36, are reproduced in *Appendices XIII and XIV.*

37. *Publications.*—The undermentioned publications were issued during the year under report :—

(1) *Statistical Leaflet No.* 1, Third Issue (1935-36), "Report on the Staple Length of the Indian Cotton Crop of 1935-36 season."

(2) *Statistical Leaflet No. 2,* Second Issue (1934-35), "Stocks of Indian raw cotton held in India by the mills and the trade on 31st August 1935."

(3) *Statistical Leaflet No.* 3, Second Issue (1935-36), "Receipts at mills in India of raw cotton classified by varieties—1934-35 season."

(4) *Statistical Leaflet No.* 4, Second Issue (1934-35), "Export by sea of Indian raw cotton classified by varieties—1934-35 season."

CHAPTER IV.

RESEARCH.

38. THE Indian Central Cotton Committee carries out its research policy by direct control of the Technological Laboratory at Matunga, Bombay, and by granting subsidies to Departments of Agriculture in provinces and States for the investigation of cotton problems mainly of an all-India importance or for large areas where cotton is an important crop. In addition the Committee contributes a large sum of money for the maintenance of the Institute of Plant Industry, Indore, where problems of fundamental, economic and agricultural importance are under investigation. The problems of research in provinces and States include, as explained in previous years, several schemes—botanical for breeding high yielding superior types of cotton, entomological for the study of the life-history of certain cotton pests and finding out measures to combat them, mycological for ascertaining ways and means to prevent loss due to wilt and root rot and physiological for the investigation of crop growth and bud and boll shedding. The Committee also provides liberal grants to Agricultural Departments and Co-operative Sale Societies for the extension and marketing of improved types of cotton and it has, in addition, undertaken jointly with the Imperial Council of Agricultural Research the investigation into the cost of the cultivation of cotton, sugarcane and their rotation crops in the principal cotton and sugarcane growing areas of India. During the year under report there were in all twenty-nine research schemes and seventeen seed extension and marketing schemes under operation, the total amount sanctioned for them being Rs. 5,75,347-7-1 besides a further sum of Rs. 3,91,663-4-10 sanctioned for the Technological Laboratory, Matunga, the Institute of Plant Industry, Indore, and the economic inquiry into the cost of cotton, sugarcane and their rotation crops. The Committee also offers scholarships and training grants for post-graduate training in India and abroad in subjects connected with cotton industry. All schemes, scholarships and training grants are first thoroughly examined and approved by the Agricultural Research Sub-Committee and the Technological Research Sub-Committee before they are finally sanctioned by the full Committee. It is also the function of these two Sub-Committees to examine the annual reports and keep the Committee in touch with the progress of each scheme.

TECHNOLOGICAL LABORATORY.

39. Details of the work carried out at the Technological Laboratory during the year will be found in the report of the Director which forms Chapter VI of this report. Whilst the resources of the Laboratory continued to be

availed of as in the past by agricultural officers in assessing the spinning value of their new strains, mills utilised to a much greater extent than in the past the facilities afforded by the Laboratory for the testing of their samples or the solution of their problems. The number of samples, lots and yarns spun in the Spinning Laboratory during the year under report recorded an increase of 24, 20 and 0.5 per cent. respectively over the figures for the previous year. Samples are tested at the Laboratory under the following groups :—(*a*) Agricultural samples, (*b*) samples of standard Indian cottons, (*c*) trade samples and (*d*) technological samples. (*a*) Agricultural samples represent either new or improved varieties under trial by Agricultural Departments and also some old types grown in connection with certain field experiments. The number of samples tested under this head was 330 against 251 in the preceding year. (*b*) The standard cottons mostly represent the improved varieties which now cover about 15 per cent. of the total area under cotton cultivation in India and they at present include the following ten varieties :—*Punjab-American* 289*F*, *Verum* 262 (Nagpur), *Verum* 262 (Akola), *V*.434 (Akola), *Late Verum* (Nagpur), *Umri Bani*, *Punjab-American* 4*F*, *Co.* 2 (*Cambodia*), *Sind Sudhar* and *Surat* 1027 *A.L.F.* The results of the tests on these cottons were published in four-page circulars, as usual. (*c*) The trade samples tested fall under two heads : (*i*) those supplied by the East India Cotton Association and which represent the fair average quality of different varieties of Indian cotton which form the bulk of the cotton crop ; and (*ii*) those supplied under arrangement with the Bombay and Ahmedabad Millowners' Associations and which represent the early arrivals of the various Indian cottons into the local markets. Altogether 18 samples of the first category and 22 of the second were tested during the year and the results were published in 2 or 3-page circulars which were widely distributed to the trade and industry both in this country and abroad. A new feature introduced during the year was the compilation of all these circulars in the form of a bulletin for ready reference which was published for the first time under the title " Technological Reports on Trade Varieties of Indian Cottons " and which appears to have been well received. In addition to these tests, samples received from individual mills and firms in their private capacity were also tested, as in the past, on payment of the fees prescribed by the Indian Central Cotton Committee. The number of such samples tested and reported upon during the year was 127 as compared with 39 in the previous year ; this increase would seem to justify the conclusion that the practical value of the Laboratory is being gradually realised by the trade. Other investigations of interest to the trade completed during the year were the effect of different degrees of compression on the spinning quality of cotton, the effect of artificial watering on the spinning quality of cotton and the deterioration of cotton stored in the open and in sheds at Karachi. (*d*) Technological samples comprise those samples of cotton tested at the Laboratory in connection with certain research problems. A brief account of some of these will be found in the Director's report. Side by side with the work of the Spinning Laboratory, problems are being investigated in the Research Section of the Laboratory, details of which are also given in the report of the Director.

The Moisture Testing Section carried out tests on 24 samples received during the period under review, 2 of which were on behalf of the Appeal Committee of the East India Cotton Association and 11 for the trade; the remaining 11 were in connection with Laboratory investigations.

INSTITUTE OF PLANT INDUSTRY, INDORE.

40. The Annual Progress Report for the year ended 30th June 1936 of the Director, Institute of Plant Industry, Indore, with the exception of Section 10 which deals with crops other than cotton, is reproduced in *Appendix IV* of this report. The Institute which was established in 1924 with the object of providing a central research station for cotton in the black soil area of the Malwa plateau is maintained by annual contributions from the Indian Central Cotton Committee and the member States in Central India and Rajputana. Although the interests of the Committee are confined mainly to cotton and those of the States to specific crop problems of their own and the dissemination of more efficient agricultural practices, the interests of both parties are complementary and are harmoniously balanced in the work of the Institute. The Committee and the member States are represented on the Governing Body of the Institute in proportion to the grants made by them; in the financial year 1935-36, the Committee's contributions to the Institute amounted to Rs. 97,600 against Rs. 67,335 of the member States. On this basis, the Committee is at present represented by nine members on the Governing Body against 5 representatives of the States. The programme of work of the Institute covers the general botany, physiology and genetics of cotton, and in addition several agricultural investigations dealing with the cultivation of cotton and other crops are also carried out.

GRANTS-IN-AID.

SCHEMES IN PROGRESS IN PROVINCES AND STATES.

Madras Presidency.

41. *The Herbaceum Scheme* is one of the oldest schemes which commenced in 1923. Its original object was to obtain from local *Uppam* (*G. herbaceum*) suitable types to replace *Karunganni* (*G. indicum*) in 'Salems' and 'Tinnevellies' tracts where rainfall is low and uncertain. In years of good rainfall *Karunganni* gives a much higher yield than *Uppam* but in bad years the position is reversed, *Uppam* being a hardier variety capable of giving a fair yield even under adverse climatic conditions. The cultivator meets the situation by growing a mixture of the two cottons. The *Karunganni* strains which are now being distributed by the Agricultural Department are capable of spinning upto 26's warp counts against 14's of *Uppam* and the original intention of the scheme therefore was to produce one or more high yielding strains of *Uppam* which could spin at least upto

20's. It was, however, realised after 7 years' work that the chances of obtaining pure strains from *Uppam* that would come up to the standard were few and the Committee therefore extended the scheme in 1930 for a further period of five years for securing by hybridisation what was not possible by unit selections.

The new line of work has already produced promising results. Of the two hybrid strains, 4803 and 4714, reported last year as promising, the latter has once again proved very satisfactory and that also in one of the most droughty and trying years experienced within the past two decades. In yield it has proved superior to *Karunganni* strains and it is capable of spinning upto 27's standard warp. It is also satisfactory from the point of ginning outturn, drought resistance and ability to withstand untimely February rains, common to 'Salems' and 'Tinnevellies' tracts. It has, however, the disadvantage of being a narrow-lobed variety which is likely to be mistaken for *G. roseum*. Attempts are being made to isolate broad-lobed mutants which recur every year in this strain.

The work on purification of selections from other crosses was continued as usual.

42. *Pempheres and Physiological Scheme.*—This scheme seriously commenced work only in February 1935, though the preliminary investigations were started in 1931 pending the return of the two officers deputed for special training in England in plant physiology and bio-chemistry before they were appointed as Physiological Botanist and Bio-chemist respectively under the scheme. The principal object of the scheme is, as finally decided by the Committee in January 1935, to minimise by breeding and physiological methods bud, flower and boll shedding in *Karunganni* (*G. indicum*) caused by untimely rains and to devise control measures against the cotton stem borer, (*Pempheres affinis*), a serious pest in all Tamil districts (Tinnevellies, Salems and Cambodia tracts) and to some extent in the Vizagapatam district. The incidence of the pest varies in inverse proportion to the length of the close period between two cotton crops and also cottons grown under drier conditions seem to suffer less than those receiving irrigation or intermittent rainfall throughout their growth period. Four species of parasites, a Braconid and three species of Chalcids, were found during the survey of the pest to parasitise the grub stages of the stem borer and no parasite has so far been observed on the egg, pupa and adult stages. The four parasites put together do not seem to account for more than 5 per cent. of the mortality of the larvæ but under favourable conditions the Braconid parasite may give better results.

The work of the year on botanical research shows that of the large number of varieties of cotton tested, only four, *viz.*, *Quebradinho*, *Verdavo*, *Moeo* and *Bourbon*, suffered low mortality from the pest. Local varieties, barring *Nadam*, suffered more than *Co.* 2 (*Cambodia*) when they were grown under similar conditions and their comparative freedom from the pest is

probably due to local rotations and late sowing. The most interesting feature of this year's observations is that *Quebradinho, Verdavo* and *Moco* produced gum more readily in the attacked parts killing the larvæ before they reached adult stage and emerged out of the plants. They are, however, late in maturing and poor in yield compared with *Co.* 2, but they may prove useful for breeding tolerant types.

The bio-chemical investigation shows that the gum formation in the attacked plants is due to the bacterial activity and is associated with the carbohydrate make-up of the plant. It has been further ascertained that the three varieties of cotton which produce gum readily are richer in water soluble polysaccharides in early stages of growth than the varieties that do not readily produce gums while the reverse is the case in the later stages. If these findings are confirmed the breeding work may become easier and more precise.

43. *Fodder Cholam Scheme.*—This scheme was started in 1931 with a view to ascertain the causes of the harmful effects of *Cholam* (*Andropogon sorghum*) as compared with those of *Cumbu* (*Pennisetum typhoideum*) on the succeeding crop of cotton in the black cotton soils of Tinnevelly district and to find out suitable remedial measures in order that the cultivators of this district might have their *cholam* fodder without suffering any loss in the yield of the succeeding cotton. The results obtained during the year once again indicate that *cholam* does not exhaust soil any more than *cumbu* though in *cholam* soils clay contents tend to increase with the crop growth. The study on the changes in the cationic composition of the clay in soils was continued and the results once again show a general tendency to a rise of exchangeable sodium and corresponding fall in magnesium in *cholam* plots as compared with *cumbu* plots. Mention has been made in previous reports that the harmful effects of *cholam* crop on the succeeding crop of cotton are not noticed if the former is cut at the shot blade stage and that the prevention of grain formation by topping the plants at the flowering stage, by sowing the crop late and harvesting it at the shot blade stage at the normal harvesting time and by thick sowing results in low yield of fodder which the cultivators cannot afford. With a view, therefore, to find out a suitable mixture of *cholam* and pulse crops which could balance the deleterious effects of *cholam* without lowering the yield of fodder mixtures with black and green gram were tried during the year and their after-effects on cotton will be studied next year.

44. *The Nadam Cotton Breeding Scheme* commenced in February 1933, with the object of securing one or more suitable annual types of cotton to replace *Nadam* (*G. obtusifolium*), a perennial variety in the red soil areas of Salem and Coimbatore districts where due to the poverty of soil and precarious rainfall neither *Karunganni* (*G. indicum*) nor *Uppam* (*G. herbaceum*) grows satisfactorily. *Nadam* being a perennial cotton serves as a breeding ground for

the stem-weevil and pink boll-worm during the close period of *Cambodia* prescribed by the Madras Pest Act, and if an annual variety suitable for light soils of the two districts is secured it will be possible to extend the Pest Act to the whole of *Cambodia* tract without exception and thus avoid damage to *Cambodia* cotton.

The work of the year under report gives again an indication of the possibility of securing suitable annual types which could replace *Nadam*. A large number of selections from *Co.* 2 (*Cambodia*) and *Nadam* and crosses between *Co.* 2 and *Bourbon*, *Co.* 2 and South African cottons, *Bourbon* and South African cottons, *Nadam* and *Karunganni* and *Nadam* and *Karunganni* back crossed with *Karunganni* were tested and the results obtained from some of the crosses between *Co.* 2 and *U.*4 (South African) and *Co.* 2 and *A.*12 (South African) were quite encouraging. They yielded on small plots at the rate of from 240 to 290 lbs. of unginned cotton per acre against 60 lbs. in the first year, 250 lbs. in the second year and 100 lbs. in the third year from *Nadam*. *Cambodia* also gave good results when it was given a spacing of 18″ × 9′.

Bombay Presidency.

45. *The Broach Cotton Breeding Scheme*, which has now completed its fourth year, has for its object the breeding of suitable types of cotton for the Nerbudda-Mahi zone with wilt resistant, heavy yielding, high ginning and good spinning qualities to replace the local mixture consisting of a large percentage of *Goghari*, a rough and short-staple variety, susceptible to wilt but with a high ginning outturn. Of the eight *F*1 to *F*5 crosses critically studied during the year, 13 single plant cultures of *B.D.* 8 × *G.A.* 26, *F*5 generation, 33 of *B.D.* 8 × (*B.D.* 8 × *G.A.* 26-*F*1), *F*3 generation and 6 of *B.D.* 8 × *S.* 7-1, *F*3 generation have been found free from wilt attack. Some of these cultures were also fairly uniform for economic characters such as yield, ginning outturn, staple length and fineness of fibre. All these cultures will be further tested on a large scale next year for purity of characters. Most of the crosses examined last year were re-crossed with *B.D.* 8, one of their parents, with a view to increasing rapidly homozygosity for high wilt resistance and spinning qualities.

Of the single line selections *N.S.* 12 maintained again its previous record of wilt resistance and other economic characters.

46. *Jalgaon Cotton Breeding Scheme.*—This scheme, like the above, commenced in April 1932, with a view to secure by unit selection or hybridisation suitable wilt resistant types with heavy yielding high ginning and good spinning qualities to replace local *N.R.* and *Banilla* in Khandesh. *Banilla* is superior to local *N.R.* in ginning outturn and spinning characters and gives better return to the cultivator. It is, however, susceptible to wilt and has also deteriorated in spinning quality since it was first introduced.

The three selections, *N.V.* 57-7, *N.V.* 56-3 and *N.V.* 56-17, which were reported as promising last year, have maintained again this year their superiority almost in every respect over *Banilla*, *N.R.* 6 and local *N.R.* Of the three new selections, *N.V.* 56-3 is better drought resistant and more vigorous in growth and also gives higher ginning outturn than *N.V.* 57-7, the next best. It spins up to 40's against 41's of *N.V.* 57-7 and 35's of *N.V.* 56-17. The highest spinning capacity of *Banilla* varies from 10's to 15's while *N.R.* spins only upto 7's.

Many other new promising selections are under severe tests for wilt resistance.

47. *The Scheme for Survey of Goghari Cotton in Gujerat* is the outcome of the Committee's policy to establish 1027 *A.L.F.* to the exclusion of all other varieties of cotton in the tract lying south of the Nerbudda. A seed scheme was accordingly started in 1934 for rapid expansion of 1027 *A.L.F.* Subsequent experience, however, revealed that to achieve the Committee's object within a reasonable time it was necessary to start a campaign against *Goghari*, an inferior short-staple variety which was favoured by ginners because of its high ginning percentage. A separate scheme for the survey of *Goghari* cotton was therefore started in January 1935, with a view to trace this cotton to ginneries and induce their owners to discourage its cultivation by refusing to pay high prices for it. During the year under report 93 villages were surveyed in Jalalpore, Bardoli and Ankleshwar talukas and the results show that due to the active propaganda during the past two years there was a marked decrease of the area under *Goghari* this year except in a few villages in Ankleshwar taluka. The total area under *Goghari* and its mixture came down from 1,813 acres last year to 660 acres this year. The ginowners also were more reasonable than last year and co-operated with the Department of Agriculture by ginning pure and mixed *Goghari* separately and disposing of the seed in such a way as it would not be used for sowing.

Now that legislation has been passed by the Bombay and Baroda Governments prohibiting the cultivation, mixing or possession of *Goghari* cotton in Gujerat and that it has been brought to the notice of the cultivators by intensive propaganda, it is hoped that this cotton will completely disappear within the next one or two years.

48. *Plant Puller Propaganda Scheme in Surat and Broach Districts.*—This scheme is the result of the Surat Boll-worm Clean-up Scheme sanctioned in 1930 for the purpose of bringing home to the cultivator in Gujerat the advantages of uprooting cotton stalks and stubbles before the end of May and thus depriving the pink and spotted boll-worms of the food material till the next crop of cotton. The clean-up scheme clearly demonstrated that by removing cotton stalks and stubbles in time the cultivator would obtain 25 to 30 per cent. more yield and on the termination of the scheme in 1934

the Committee sanctioned the Plant Puller Propaganda Scheme, with a view to popularise the cotton plant puller, a cheap and effective implement for uprooting cotton plants.

During the year under report the propaganda work continued on the same lines as in previous years, *viz.*, by means of public lectures, magic-lantern shows and practical demonstrations. Due, however, to severe damage to the cotton crop by frost in January 1935, and to the action taken by some of the cultivators to grub the damaged crop with the local harrow, it was not possible to sell more than 739 plant pullers against 1,536 last year in Surat district and 2,271 against 3,441 in Broach district. The area uprooted was 56,000 acres or 20 per cent. of the total area under cotton in Surat district and 143,296 acres or 62 per cent. in Broach district.

49. *Scheme for Defibration of Cotton Seed.*—The installation of the defibrating machine having been completed in January 1936, preliminary tests were commenced in the latter half of February. The quantity of seed treated was only 6,720 lbs., but the results indicate that defibration of local seed is not an economic proposition. The experiment will be repeated next year.

SIND.

50. *The Sind Physiological Scheme* was commenced in July 1927, with the object of ascertaining the optimum sowing time and irrigation and manurial requirements of cotton so that the Department of Agriculture might be in a position to advise the cultivator authoritatively on these points by the time the Sukkur Barrage was opened. In 1932 it was definitely concluded that March 15th to May 15th was the optimum sowing period for cotton under irrigated conditions in Sind and the investigation of the remaining two points, *viz.*, the irrigation and manurial requirements of cotton, was continued. The work of the year under report is again a repetition of what was done during the past two years and the results obtained are once more in conformity with those of previous years. The irrigation experiments show that water requirements of cotton are the highest during the flowering and fruiting periods and that an initial watering of 8 inches during the first 28 days followed in succession by two irrigations of 3 inches each at an interval of 20 days, three irrigations of 3 inches each at 15 days' interval and five irrigations of 3 inches each at 10 days' interval gives decidedly higher yield than the local method of 4 inches every 20 days after the initial irrigation of 8 inches or any other method of irrigation practicable under Barrage conditions.

The manurial experiments have proved again that the application of manure to cotton is a profitable concern in Sind and that satisfactory returns can be expected when compost alone at the rate of 15 cart-loads per acre before sowing or compost at the rate of 7½ cart-loads per acre before sowing followed by ammonium sulphate at the rate of 50 to

100 lbs. per acre 1½ months to 3½ months after sowing was applied. Best yields were obtained when the quantity of ammonium sulphate was increased to 200 lbs. in addition to the basal application of compost.

Punjab.

51. *Botanical Scheme.*—This scheme was started in 1925 with the object of enquiring into the causes of the periodic failures of *American* cotton in the Canal Colonies and obtaining suitable types of *American* and *Desi* cotton to replace the 4*F* and *Desi* cottons respectively. In view, however, of the immediate economic value of the improved types of cotton efforts are being concentrated on the problem of breeding and as will be seen below a separate physiological scheme has since been sanctioned for the investigation of the more difficult question of periodic failures of *American* cotton.

It was reported last year that after extensive trials under different conditions of soil and climate 43*F*, the best of the new *American* types, was finally selected for general distribution in place of 4*F*. During the year under report it again maintained its superiority over the three old types, 4*F*, 289*F* and *L.S.S.* and gave satisfactory yields on an area of 6,000 acres under ordinary field conditions. It is expected to extend over 25,000 acres in 1936-37 season.

38*F*, another promising strain of *American* cotton, is gaining popularity in drier parts of the province where *jassid* is not a serious pest. It did well at Khanewal and also in Nabha State where in one *pargana* it is reported to have given a high average yield of 16 maunds per acre.

One other new strain of *American* cotton, 47*F*, which is still under final tests, appears to be superior even to 43*F* in respect of yield, ginning outturn and hardiness and is capable of spinning upto 50's standard warp counts.

Of the *Desi* varieties, 39*M*, which was also issued last year for distribution to the cultivators, is reported to have given during the year satisfactory yields everywhere it was grown on commercial scale. A large number of pure line and hybrid strains are under final tests.

52. *The Physiological Scheme*, as mentioned above, has for its object the investigation into the causes of the periodic partial failure of the American cotton in the Punjab and it commenced work in March 1935. This failure was in the past attributed to heat stroke, unfavourable combination of climatic and soil factors, white fly and *jassid* attack and concentration of salts in the feeding zones of the roots, though none of these theories was supported by scientific data. The first symptoms of the complaint were the reddening and bronzing of the leaves at the reproductive stage and as

similar symptoms in other crops had been shown by various workers to be due to nutritional disorders, the present investigation was commenced with manurial tests with magnesium, manganese and iron salts which gave no significant results. The next line of attack, *viz.*, the study of the internal structure of the plant, has given some striking results, revealing certain abnormalities in the leaf, stem and root which are probably responsible for defective boll-opening. In the case of the leaf the abnormalities may be summed up as accumulation of starch which is followed by the disintegration of the chloroplasts, the production of excessive quantities of tannin and in the later stages the reddening of leaf due to the presence of anthocyanin pigments. In the root the first symptoms of abnormality is the brownian movement of very small particles, which aggregate in cells and form colonies covered with yellow mucilaginous mass. Later on these masses darken in colour and increase in numbers. They are situated in the cortical region and in the phlœm. Another change which takes place in the root cells is the formation of deposits in the cortex and the phlœm which appear to be protein precipitates. Ultimately the whole of the tissue of the bark becomes filled with these deposits which extend into the medullary rays and the xylem parenchyma. The conducting channels for the translocation of plastic material are thus filled with the precipitates of proteins, fats and tannins. Similar symptoms appear in the stem also.

53. *Pink and Spotted Boll-worm Scheme.*—In 1926 the Committee sanctioned a Pink Boll-worm Scheme with the object of ascertaining the causes responsible for the difference in the incidence of the pink boll-worm between the Canal Colonies where it is practically absent and the South-East Punjab, where its attack on cotton is severe. The Pink Boll-worm Scheme came to an end in 1934 when it was replaced by the present combined scheme, *viz.*, the Pink and Spotted Boll-worm Scheme, for the continuation of the work on the pink boll-worm and the investigation of certain economic aspects of the spotted boll-worm. The results of the Pink Boll-worm Scheme have been given in previous reports wherein it has been explained that the unequal distribution of the insect is mainly due to the difference in temperature and humidity between different areas. The study of the spotted boll-worm pest during the year under report shows that unlike the pink boll-worm pest it is more severe at Lyallpur and Multan, representative of Canal Colonies and Western Punjab than elsewhere. The loss due to the pest this year is estimated from the results of the night caging experiments at 26 per cent. in *Desi* (local cotton) and 10 per cent. in 4*F* (American variety) against 65 per cent. and 47 per cent. respectively last year.

It was mentioned in the last year's report that in the Punjab cotton sprouts from the previous year's stumps were the only source of food supply to the spotted boll-worm for about six weeks from the middle of April. Further survey of food plants during the year under report shows that while this observation holds good so far as the Canal Colonies are concerned, the

same cannot be said of the south eastern, central and sub-montane regions where in addition to cotton sprouts other host plants, particularly *Malva parviflora*, *Abutilon indicum* and *Malvestrum tricuspidatum* serve as breeding ground in the off season. It is thus evident that any clean-up scheme for uprooting cotton stalks and stubbles to avoid the boll-worm pest is not likely to yield satisfactory results unless the other host plants are simultaneously dealt with.

Of the three species of *Earias* (spotted boll-worm), *viz.*, *insulana*, *fabia* and *cupreoviridis* met with in the Punjab, only the first two are cotton pests, the first being by far the commonest. *Insulana* is seen feeding on all host plants so far known in the Punjab while *fabia* is observed only on *Hibiscus esculentus* and rarely on other plants. *Insulana* and *fabia* remain active throughout the year while *cupreoviridis* hibernates in the form of pupa from October to April.

54. *The White Fly Scheme* was started in 1931 with a view to study the life-history of the white fly (*Bemesia gossypiperda*), a small sucking insect that does damage to cotton and other crops, and it came to an end in September 1936. The work of the year again confirms the results already obtained on the seasonal history of the pest. The most active period of the pest is from May to September and at the end of this period it migrates from cotton to alternative host plants like *Brasicæ*, *Solanum tuberosum*, *Lycopersicum esculantum* and various weeds on which it passes winter. From March to May it extends to cultivated cucurbits and ratoon cotton and goes back thereafter to the new cotton crop on which it establishes itself once again. Infestation was found higher again this year on *Mollisoni* than on the *Punjab-American* types and was reduced to some extent when ammonium sulphate was applied to the crop early in the season.

The chemical analysis of the affected and unaffected plants shows little difference in their nitrogen content till about the second week of July. Thereafter till the end of August the unaffected plants contain more nitrogen than the affected ones. The total quantity of nitrogen produced in a season in an unaffected plant amounts on an average to 1.20 grams against 0.95 grams in an infested plant and also the percentage of nitrogen transported from the vegetative to reproductive organs of the affected and uninfested plants is estimated at 12 and 20 respectively.

55. *Root Rot Scheme.*—This scheme commenced in 1932 for the investigation of root rot in the Punjab, where, particularly in the canal irrigated areas, the annual damage done to cotton by this disease is estimated at Rs. 16 lakhs. Both *Desi* and American varieties are equally susceptible to this disease which makes its appearance towards the end of June when the crop is 6–8 weeks old and continues up to the middle of September. The disease is, however, practically harmless on any cotton grown under rainfed conditions

and its activity seems to vary directly in proportion to the number of irrigations or the amount of moisture in the soil. It affects cotton and many leguminous crops but cereal crops like *Maize* (*Zea mais*), *Bajree* (*Pennisetum typhoideum*) and *Jowar* (*Andropogon sorghum*) are free from its effects though the causal organisms, *Rhizoctonia bataticola* and *Rizoctonia solani* are present on their roots. The two organisms are carried over from year to year in live as well as decayed roots unlike the American root rot fungus (*Phymatotrichum omnivorum*) which lives only in live roots.

There is no type of cotton, *Desi* or American, in the Punjab at present which can resist the attack of root rot. Some of the plants of *Desi* and American types which appeared unaffected in a severely infested plot were selfed in 1934 and their progeny was tested in 1935. The results show that they were only escapes and not resistant to the disease. All the plants which looked again unaffected like their parents were selfed and such of them that had their roots free from the root rot organisms have been selected for further tests.

The physiological investigation of the two causal organisms give an indication that the application of ammonium salts might prove useful to minimise the disease but the results require further confirmation. Some interesting results have also been obtained from the study on the effect of temperature and hydrocyanic acid gas on *sclerotia*.

Central Provinces.

56. *Botanical Scheme.*—This is one of the Committee's earliest schemes sanctioned in 1923 for the purpose of obtaining wilt resistant, high yielding and fine spinning types of cotton suitable for the Central Provinces and Berar. This scheme, unlike other schemes, had the advantage of the cotton selection work already started by the Agricultural Department before it was sanctioned and it was therefore possible to obtain very soon a new type *Verum*-262 which looked at the time satisfactory from every point of view. It was, however, soon realised that this type, being susceptible to adverse climatic conditions, was unsuitable and attention was therefore directed to the selection of new strains free from this defect and if possible with better yielding and spinning qualities. The object has now been achieved and it is only a question of two or three years more when *Verum*-262 is completely replaced by three superior strains, *V*-434, *Late Verum* and *V*-438 which satisfy the needs of the different cotton growing areas of the province. They are also expected to replace the local short staple varieties wherever possible.

V-434 has proved its superiority over all other new strains in almost every part of the province under varied conditions of soil and climate. It is prolific, wilt resistant, quick in forming buds and setting bolls and

comparatively low shedding. It has also good lint characters and high ginning percentage. It spins upto 32's standard warp against 22's of *V*-262 and 10 to 12's of local cotton and fetches high premium on *Broach*.

Late Verum suffered considerably during the year under report owing to the early cessation of the monsoon and the total absence of late rains. It is particularly suitable for areas where the monsoon lasts till late in the season. It has nearly all the desirable characters of *V*-434 and spins upto 36's standard warp.

V-438 is specially suitable for soils of lighter descriptions and is expected to cover soon a large area in Nimar district. Its lint is almost as good as that of *V*-434.

Of the other new strains under tests, *Buri A.K.* special and No. 107, the two American types, have done well again and there is already good demand for their seed from Nimar district and many places in Berar. They spin upto 44's standard warp. Work on *Bani* 306 and *E.B.* 31 (*indicum types*) continued on the lines of previous years. Six new promising strains have been isolated from them and they are being tested for wilt resistance.

57. *The Entomological Scheme*, which commenced in June 1934, has for its object the preliminary survey of the cotton boll-worm pest in the Central Provinces and Berar where it has been doing much damage to cotton with a view to ascertain its incidence, method of carry-over and the extent to which the results obtained from the Surat Boll-worm Clean-up Scheme can be usefully applied to this province. The work of the past two years shows that three types of boll-worms, *viz.*, the spotted boll-worm (*Earias fabia*), the pink boll-worm (*Platyedra gossypiella*) and the cotton boll-worm of America, locally known as gram caterpillar [*Heliothis* (*chloridea*) *obsoleta*], are the cause of much damage to the cotton crop in the province. The spotted boll-worm makes its first appearance about the last week of July when the cotton seedlings are 6"—9" high and continues to feed on the crop till about the end of January, first on the tender shoots of seedlings and later on buds and tender bolls when they are formed. During the year under report the population of the spotted boll-worm remained low till the middle of October and thereafter it began to increase till the end of November when it reached its maximum. With the beginning of December the population began to decline gradually till it reached the lowest level at the end of January. As the time of boll development coincides with the maximum increase of the population of the spotted boll-worm the damage done to cotton by this insect is serious.

The pink boll-worm is not, on the other hand, a serious pest in the Central Provinces and Berar. It appears from September onwards and its maximum population is reached sometime in January. As the pink boll-worm, unlike the spotted boll-worm, prefers mature bolls to buds and

tender bolls and also as its maximum population is reached when all the cotton pickings are over, the damage done by this insect is not serious.

The gram caterpillar was hitherto unknown in India as a cotton pest and it has been found out this year for the first time that the damage done by it to cotton in Berar is as serious as that of the other two boll-worms. Like the spotted boll-worm, the gram caterpillar begins with boring the tender shoots of cotton seedlings and attacks later on buds and young bolls when they are formed. It continues damaging the crop till about the end of October when the bud formation is at its height and disappears thereafter temporarily till November when it again makes its appearance on the gram crop.

As regards the carry-over of the three boll-worms, the last picking of cotton is usually over by the month of January and there is an interval of nearly six months between the old and next new crop. The boll-worms have however no difficulty in tiding over this period as according to the local practices of cultivation cotton plants in many localities are not removed off the fields till about the middle of May. In May and June the supply of food in cotton fields becomes scarce and during this period they live on the available alternative food plants such as *Hibiscus esculentus*, *H. pandurifformis*, *H. cannabinus*, *Abutilon spp.*, hollyhock and perennial cotton trees.

The foregoing account shows that the position of the boll-worm pest in the Central Provinces and Berar is about the same as in Gujerat and the only practical way of controlling it is to adopt clean-up measures similar to those adopted in Gujerat, *viz.*, the uprooting of cotton stalks and stubbles and eradication of alternative host plants as early as possible after the harvest of cotton.

United Provinces.

58. *The Cotton Survey Scheme* commenced in 1933 with a view to carry out a detailed survey of the *Bengals* types of cotton grown in Rohilkhand and Bundelkhand to facilitate the selection of suitable types of cotton for the different cotton growing areas of the province. The survey was continued during the year in Moradabad, Naini Tal and Bijnor districts of Rohilkhand Division and representative samples were collected from no fewer than 2,479 villages. The examination of these samples show that the predominating type of this tract is a narrow-lobed, yellow-flowered variety with varying quality of lint. White-flowered variety is comparatively rare and broad-lobed white-flowered type is rarer still. 1,321 of these samples have been retained in a preliminary selection and only the promising few of them will be tested next year.

The single plant cultures of the selections made out of the material collected in 1933 from Rohilkhand districts were tested during the year

and all promising plants were selfed and their ginning percentages were worked out. The unselfed plants of all cultures were also picked and examined for quality of lint and the best of them were retained for testing their ginning outturn next year. A large number of single plant cultures selected out of the material obtained in 1934 from Bundelkhand districts and adjoining States were likewise tested and all the promising plants were selfed for further tests.

BENGAL.

59. *The Comilla Cotton Scheme* has for its object the botanical and systematic study and improvement of the commercial grade of *Cernuum* cotton and was started in December 1934. The work of the year mainly consists of testing the field and commercial characters of the single plant selections obtained last year from different types of *Comillas* and Assam cottons and making as in last year further selections from the cultivators' fields. Reciprocal crosses were also made with two local types and *Garrow Hill No.* 6.

BURMA.

60. *The Cotton Improvement Scheme* was started in April 1931, with the object of bringing home to the cultivators of the *Wagale* tract, by means of practical demonstrations, the better methods of cotton cultivation. The Committee provides funds for the employment each year of not more than 24 demonstrators and for the purchase of the necessary implements for demonstration. During the year under report there were 24 demonstrators in charge of 71 demonstration holdings in the four cotton districts of Meiktila, Myingyan, Sagaing and Lower Chindwin. These holdings, in most cases, are producing conspicuous effect and the improvement obtained in many of them after a few years' working is quite encouraging. During the year under report the average yield for the demonstration holdings exceeded the average for Meiktila and Sagaing districts by 39 per cent., for Myingyan by 51 per cent. and for Lower Chindwin by 47 per cent. Also the drill-sown area, the number of seed drills and bullock cultivators in use, the number of cultivators conserving manure and the area under improved layout have considerably increased since 1931 when the scheme was started.

HYDERABAD.

61. *The Botanical Research Scheme* commenced in 1929 at Parbhani with a view to obtain a few prolific high ginning uniform types of cotton with good spinning qualities to replace the present mixture of *Gaorani* cotton in Hyderabad State. *Gaorani* or *Bani* is probably the best of the indigenous cottons from the point of spinning. It is, however, poor in yield and ginning outturn and but for the timely steps taken by the Local Government to prevent its further deterioration it should have been, by now, completely replaced by inferior varieties of short staple high ginning *neglectums.*

The work of the year mainly consists of testing old and new strains and making new single plant selections from *Gaorani* mixture and short staple

varieties. There were four varietal tests, two for the comparison of *Gaorani* or medium staple strains intended for the *Gaorani* tract and two of short staple strains for the short staple areas of Parbhani and Aurangabad districts. In one of the first two tests which was repeated at Parbhani, Nanded and Mudhol the combined results show that all the old strains tested, *viz.*, *G*.4, *G*.6, *G*.55 and *P*.25 are about equal to one another in yield and superior to the local *Gaorani* mixture in every respect. In the second test at Parbhani with the exception of *G*.6 and *G*.69 all other strains, *viz.*, *G*.4, *G*.3*B*-1, *G*.58-*E* and *P*.26 gave higher yields than the same control *Gaorani* mixture. *G*.6, an early maturing variety, suffered more than other varieties from abnormal weather conditions and heavy boll-worm attack. In the remaining two tests *Havri* 3, a *roseum* strain, proved again a better yielder than all other strains tested. There were two other similar tests between a large number of new strains and a few old ones. The results show that of the 29 new *Gaorani* strains tested four, *viz.*, *G*.4-*B*, *G*.4-*B*4, *G*.4-*B*5 and *G*.58-*A*1, are likely to prove satisfactory while none of the new short staple strains come up to the level of *Havri* 3.

G.4 and *G*.6, which have given very promising results in comparative trials during the past three years, were tested this year side by side with *Gaorani* mixture as control in cultivators' fields. *G*.4 failed for some reason or other to compete successfully with the control while *G*.6 fared better. *G*.4 and *G*.6 were also tested on a commercial scale on 900 and 500 acres respectively in Nanded district. Here also *G*.4 failed to come up to the expectation while *G*.6 gave satisfactory yield. *G*.4 and *G*.6 spin up to 33's and 40's warp counts respectively.

62. *The Pink and Spotted Boll-worm Scheme* was started in January 1933, with a view to ascertain (*a*) the actual amount of damage done to cotton in the Godavary valley by the boll-worm pest, (*b*) the progress of its attack on the growing crop, (*c*) the mode of its carry-over from season to season and (*d*) the effect of the likely control measures. The work of the year under report is more or less a repetition of what was done during the last year and consists of (*a*) a survey of the incidence of the boll-worm attack and damage done by it to the harvested crop and (*b*) the study of the behaviour of the full-fed larvæ of pink and spotted boll-worms and the manner the boll-worm pest is carried over from one season to the next. The results show that, as observed during the last year, the spotted boll-worm is practically never absent and rapidly increases in numbers in September and October, when the weather conditions are favourable. The maximum incidence of its attack is attained in December. It commences to decline thereafter till about the middle of February when it again starts increasing. It lives during the off season on cotton plants left over in fields and on alternative host plants and pupates in cotton and other food plants, in their shed parts and in the soil. The damage done by the spotted boll-worm during the year amounted to 10 to 28 per cent. of buds, 20 to 58 per cent. of green bolls and 7 to 8 per cent. of *kapas*.

The pink boll-worm pest makes its first appearance from June onwards and reaches its maximum incidence in January-February when it begins to decrease till it becomes negligible at the end of April. It continues as short cycle larvæ on "stand over cotton" till the beginning of May. Thereafter it spends a short time in the quiescent stage and emerges as long cycle moth on the return of favourable weather after the setting in of the South-West monsoon. The long cycle moth finds ready breeding ground in the previous year's crop still left in the fields in many localities due to the local practice of delaying the annual leases of cultivated land till the middle of April. The pink boll-worm passes its resting stage in the stored seed cotton and in the soil and unlike in the United Provinces it does not survive in the stored seed. The damage done by this insect is estimated at 14 to 35 per cent. of the yield.

The gram caterpillar, *Heliothis* (*Chloridea*) *obsoleta*, which has been found to be causing much damage to cotton in the Central Provinces and Berar, has not yet attracted much attention in Hyderabad State.

Baroda.

63. *Root Rot Scheme.*—This scheme was started in February 1932 with the double object of studying the root rot disease and securing a few suitable strains of cotton which are resistant to this disease. The work of the past four years shows that the disease is less severe in years of normal rainfall than in years of high rainfall and also in late sown crop than in early sown crop. The affected cotton roots contain the organisms of *Macrophomina phaseoli*, *Nemas* and some *Fusaria* which are also found in several other crops and weed plants suffering from similar disease, but the infection experiments show that while the first two organisms are the real cause of the disease, the *Fusaria* are practically harmless. The activity of *Macrophomina* begins at 30° C. and reaches optimum at 36° C. Sucrose appears to be helpful to its growth while ammonia has retarding effect, but *Sclerotia* (resting spores) produced luxuriant growth when they are exposed to liquor ammonia even for ten days. They are however killed when exposed to formaldehyde.

On the Botanical side, five selections, *viz.*, *K.S.*, *B.S.*, *D.S.*, *No.* 8 and *No.* 9, are found more resistant to root rot than the control and no significant difference has been noticed between themselves, though *K.S.* looks a little more promising than the rest.

64. *The Goghari Cotton Survey Scheme* is similar to the *Goghari* Cotton Survey Scheme in the Bombay Presidency and has for its object the survey of *Goghari* cotton crop in Baroda State, with a view to trace the produce to ginneries and induce them to gin it separately and dispose of the seed for cattle food. During the year under report the survey was again confined to the same four talukas that were dealt with last year, *viz.*, Navsari, Mahuva, Palsana and Gandevi, though the number of villages was increased to 118

from 95 of last year. The total area surveyed was about 55,000 *bighas* (32,353 acres) belonging to 6,409 cultivators, and only 85 of the latter, all in Navsari taluka, were found growing *Goghari* as more than 5 per cent. mixture. Nowhere in the remaining three talukas did the *Goghari* mixture exceed 5 per cent., while in Gandevi taluka the entire cotton crop was practically free from it. A list of the names of cultivators who grew more than 5 per cent. mixture was circulated to the ginowners who had undertaken to gin such cotton separately and sell the seed for cattle food. The Bombay Cotton Control Act has been applied to the Baroda State, with necessary modifications and omissions, to meet the requirements of the State. This will, it is hoped, effectively check, if not completely eliminate the menace of *Goghari*.

65. *Plant Puller Propaganda Scheme.*—This scheme, which commenced in January 1936, is identical with the Plant Puller Propaganda Scheme in the Bombay Gujerat and is meant to popularise the cotton plant puller, a cheap and effective implement for uprooting cotton stalks and stubbles and thus encourage the cultivators to fight against the boll-worm pest by cleaning up their cotton fields as soon as the last pickings of *kapas* (seed cotton) were over. The work was started in Baroda and Navsari districts on the same lines as in Broach and Surat districts of the Bombay Presidency, and as a result of intensive propaganda, it was possible to distribute 3,000 plant pullers in Baroda district and 577 in Navsari district. The demand in Baroda district was so great that it could not be met by the manufacturers and many more plant pullers would have been sold if they had been available. In Navsari district, on the other hand, the demand was low due to the propaganda being started late and also to a feeling among the cultivators that by uprooting cotton plants the physical texture of the soil is interfered with; the low demand was also due to the plant pullers being purchased in the adjoining villages of the Bombay Presidency by some of the cultivators.

Bikaner.

66. *The Gang Canal Scheme.*—Theopening of the Gang Canal under the Sutlej Valley Scheme resulted in the colonization of a new and practically uncultivated area, now known as the Gang Canal area, with immigrant peasants mostly from the Punjab who had been accustomed to the cultivation of the Punjab *Desi* and American types of cotton. The local conditions beng different from those obtaining in the Punjab with regard to the supply of irrigation water which proved uncertain, it was feared at one time that the area under cotton would be seriously reduced. It was therefore considered necessary to sanction this scheme for the purpose of studying the local problems of agriculturists and obtaining by selection or hybridization one or more superior types of cotton suitable for the locality. The scheme was started in January 1931 and the work of the past five years clearly shows that due to their low yield and susceptibility to diseases American varieties are unsuitable for the area under the existing conditions of cultivation and

that *Cawnpore* 520 (*Desi*) is the most profitable variety to grow in this locality. *Cawnpore* 520 is superior to *Mollisoni* (*Desi*) in every respect and arrangements are being made for the multiplication and distribution of its seed. It gives best results when it is sown in the middle of May though its sowings could be extended till the latter part of June without any loss in yield ; June sowings however slightly lower the ginning outturn. It also does not require much watering and gives normal yield with as few as four irrigations when they are suitably adjusted. It will thus be seen that the usual short supply of water in the hot weather need not prevent the cultivators from sowing as much cotton as they wish on the water then available.

Mysore.

67. *The Doddahathi* (*American*) *Cotton Scheme* was sanctioned in February 1935 for the purpose of breeding suitable types from the local *Doddahathi* or American cotton, resistant to " Red Leaf " disease which stands in the way of the expansion of this crop in the Irwin Canal area in Mysore State. The work of the year in the Central Laboratory, Bangalore, indicates that *Co.* 2 (*Cambodia*), *Gadag No.* 1, 295-*F*-21, *Ashmouni*-37 and Uganda varieties are more susceptible to " Red Leaf " than 4-*F*. 98, *Sea Island*, *Co.* 1, *Boss III*-16 and *Arboreum* varieties and crosses between *Ashmouni* and *Peruvium*, 4-*F*. 98 and *Peruvium* and *Sakel* and *Peruvium*. At the Irwin Canal Farm 38-*F*, 4-*F* and *M.A. II* were sown from the 1st May, at 15 days' intervals with a view to find out if there was any relation between the disease and the time of sowing. The results indicate the existence of such relation. A large number of crosses was made during the year between exotic, indigenous and wild varieties and the behaviour of their progenies to " Red Leaf " will be studied next year.

CHAPTER V.

SEED DISTRIBUTION SCHEMES.

68. During the first five years of its existence, the Committee devoted itself chiefly to botanical and other research on cotton, but in 1929 it felt that if its work was to be of practical benefit, the results obtained by research should be made easily available to the cultivator. In this year, therefore, the Committee adopted the policy of helping Agricultural Departments and Co-operative Sale Societies in the more extended distribution of pure seed of improved varieties of cotton. Since 1929, twenty seed distribution and extension schemes have been sanctioned and of these 17 are at present in operation. Three of the sanctioned schemes for one reason or another never started; one of these has since been withdrawn and the other two have been merged in a larger and more comprehensive scheme. A short account of these schemes is given below.

MADRAS PRESIDENCY.

69. *The Tiruppur Co.* 2 (*Cambodia*) *Seed Extension Scheme.*—The Madras (Tiruppur) Seed Extension Scheme was sanctioned in 1929 for a period of five years with the object of providing for the pay of an officer to act as an adviser to a group of Co-operative Societies in Coimbatore District which were growing improved strains of Cambodia cotton and also to help the Agricultural Department in their seed distribution work. It started work in May 1931 and was extended in June 1936 for a short period of three months. This scheme was amalgamated in 1933 with a new scheme known as the Tiruppur *Co.* 2 (*Cambodia*) Seed Extension Scheme which was sanctioned in August 1932 for a period of five years for the distribution of *Co.* 2 seed in the Salem and Coimbatore districts through the agency of the Madras Agricultural Department and the Tiruppur Co-operative Trading Society. The object of the second scheme was the maintenance by the Agricultural Department with a grant from the Committee of a seed multiplication area of not less than 6,000 acres, and the distribution by the Society to the cultivators of the pure seed produced in this area for 100,000 acres. The Committee has further guaranteed the Tiruppur Co-operative Trading Society its actual loss on seed transactions up to a maximum of 10 per cent. of the capital invested for the purchase of seed and interest thereon at 5 per cent. In 1934-35, the cotton crop in Tiruppur was so badly affected by pests and adverse climatic conditions that it gave only a poor average yield of about 420 lbs. of *kapas* per acre. The total quantity of pure seed obtained from the multiplication areas and selected cultivators was 1,348,171 lbs. of which only 1,009,471 lbs. were sold for sowing in 1935-36, the rest being disposed of as cattle food.

In 1935-36, the Department of Agriculture issued pure seed for 6,249 acres of seed multiplication area, but due to the failure of rains and the inadequacy of water in wells at the sowing season, the cultivators utilised it for 5,320 acres only by sowing at a higher seed rate. For the same reasons the yield of cotton is not expected to exceed 280 lbs. per acre. That *Co.* 2 is appreciated both by the *ryots* and merchants is evidenced by the fact that the natural spread of this variety of cotton exceeded 120,000 acres during 1935-36 in addition to the seed multiplication areas. The premium obtained per *candy* of 784 lbs. of *Co.* 2 cotton over local *Cambodia* ranged from Rs. 7/8 in September 1935 to Rs. 12 in November 1935.

Bombay Presidency.

70. *The Hubli Seed Extension Scheme.*—The scheme was sanctioned in November 1929 for a period of five years. It commenced work in June 1930 and was extended for one year from the 31st May 1935. It has since been merged in the revised scheme for the extension of *Jayawant* and *Gadag* 1 cottons in the Southern Division of the Bombay Presidency. Under the original scheme it was intended that the Department of Agriculture with the aid of a grant from the Committee should maintain a seed multiplication area of about 15,000 acres of *Jayawant* cotton and the Hubli Co-operative Cotton Sale Society should distribute the seed thus obtained to cover about 200,000 acres. In so far as the Society was concerned, the Committee agreed to make good to it any losses in its seed business up to a maximum of Rs. 5,000 every year and to pay interest at 5 per cent. on the capital invested for the purchase of pure seed. The Committee further granted the Society a loan of Rs. 7,629, free of interest, to be recovered from the profits in the seed transactions. During 1935-36 the Department of Agriculture maintained a reserved area of 25,377 acres but the area covered by the Society did not exceed 143,800 acres, a figure much below the stipulated area of 200,000 acres. Out of about 1,600,000 lbs. of seed expected from the reserved area 1,100,000 lbs. were stocked for distribution in 1936-37. During the season 1935-36 the yield of *Jayawant* cotton was reduced by 25 to 30 per cent. on account of unfavourable weather, inadequate soil moisture and mist and rains during the picking time in some places. The average price obtained for *Jayawant* cotton was Rs. 11 more per *naga* (1,344 lbs.) of seed cotton than for the local cotton. It has been estimated that as a result of the operation of the scheme from 1930-31 to 1935-36 the total gain to the growers of *Jayawant* cotton in Dharwar district alone comes up to Rs. 6 lakhs per annum.

71. *The Gadag Seed Extension Scheme.*—This scheme which started in June 1930 is almost identical with the Hubli scheme except that the type of seed intended for distribution is *Gadag No.* 1 and the seed multiplication area is 24,400 acres, whilst the work of distribution is done by the Gadag Co-operative Cotton Sale Society. The Committee also granted the Society a loan of Rs. 7,292 free of interest to be recovered from profits in seed

transactions. In 1935-36, the Department of Agriculture maintained a reserved area of 25,258 acres and handed over to the Society 1,250,892 lbs. pure seed of which 836,930 lbs. enough to cover 83,693 acres were distributed in the area served by it. Early in 1935-36 the crop held out good prospects ; later deterioration set in due to unfavourable weather conditions. The average premium paid for *Gadag* 1 over pure unmixed *Dharwar American* amounted to about Rs. 25 per *naga* or Rs. 3 per acre. The total gain to the growers of *Gadag* 1 cotton in Dharwar district has been estimated at Rs. 4 lakhs annually during the past six years.

72. *The Athani Seed Extension Scheme.*—The main difference between this scheme and the previous two schemes is that this scheme was run entirely by the Agricultural Department whereas the first two were conducted partly by the Agricultural Department and partly by the Cotton Sale Societies. The Athani Seed Extension Scheme which has for its object the extension of *Jayawant* seed in the Athani Taluka of Belgaum District was sanctioned in December 1931 for a period of five years and commenced work in April 1932. During the year, 1935-36, the Department of Agriculture was able to distribute to cultivators 310,283 lbs. of *Jayawant* seed to cover an area of 31,028 acres and maintained a seed multiplication area of 5,847 acres from which 350,000 lbs. of pure seed were secured and stocked for distribution in 1936-37. *Jayawant* cotton, obtained from the reserved area, fetched a premium of Rs. 2-8 to Rs. 3 per *Atki* of 200 lbs. of *kapas* over local cotton. The extra gain to the growers of this cotton has been estimated at Rs. 81,033 annually. The Athani scheme has worked so satisfactorily that it has formed the basis of the new seed multiplication scheme, *viz.*, the Revised Jayawant and Gadag No. 1 Scheme, for the whole division which was started in June 1936.

73. *The Revised Jayawant and Gadag No.* 1 *Scheme.*—Five separate schemes were sanctioned by the Committee in 1929 for the distribution and extension of *Jayawant* and *Gadag No.* 1 cottons in the Southern Division of the Bombay Presidency. These were the Hubli, Gadag, Athani, Haveri and Bailhongal Schemes. The last two schemes could not be started for several reasons whilst the first two indicated certain defects in their working which stood in the way of their continuance after the expiry of their sanctioned periods. The revised scheme is designed to embrace not only the areas covered by the five schemes mentioned above but also other areas in Dharwar, Belgaum and Bijapur districts for which there were no specific schemes. The revised scheme will be operated from seven centres, *viz.* Hubli, Haveri, Navalgund, Bailhongal, Athani, Bijapur and Bagalkot through the agency of Co-operative Societies but under the general control of the Agricultural Department. Societies agreeable to the conditions imposed will receive a subsidy not exceeding annas 6 per bag (140 lbs.) to meet handling charges and losses incurred by them. The keynote of this new scheme which came into operation in June 1936 is decentralisation so that no single agency should have too great an area to cover or too great

a responsibility to carry. This scheme has been sanctioned by the Committee for a period of five years at an estimated expenditure of Rs. 2,66,772 of which a sum of Rs. 88,332 represents the savings of the original five schemes referred to above. Sanction to the scheme is subject to the condition that the Government of Bombay should bear 25 per cent. of the net additional cost but as the Local Government have agreed to bear their share of the cost for a period of one year only, pending settlement of the question of the policy to be adopted by the Committee regarding the apportionment of the cost of schemes financed by the Committee during their extension periods, the revised scheme will be in operation for a period of one year only in the first instance.

74. *The Surat Seed Distribution and Extension Scheme.*—This scheme was sanctioned in 1929 for two years and extended for two more years in 1931 pending the decision of the Committee on the merits of the two rival varieties of 1-*A* and 1027 *A.L.F.* In January 1934 the Committee finally decided to confine its attention to the distribution of 1027 *A.L.F.* only and extended the scheme for five more years. Thus the scheme will continue till March 1939. Owing to severe frost in the middle of January 1935 and the consequent failure of the cotton crop over a large area in the Surat district, it was not possible to secure more than 1,118,906 lbs. of pure seed of 1027 *A.L.F.* but even all this quantity could not be distributed owing to the unreasonable attitude of the cultivators who attributed the failure of cotton to this seed, to the advice of a few money-lenders in favour of *Khandesh* cotton and to the difficulty experienced by farmers in finding ready money for the purchase of seed at the time of sowing. The quantity distributed did not therefore exceed 905,539 lbs. including the 289,616 lbs. supplied to the Idar and Chhota Udepur States against the total distribution of 2,312,818 lbs. during the last year. The Agricultural Department maintained a seed multiplication area of 12,828 acres and the seed obtained from this area will be distributed for sowing in 1936-37 season.

75. *The Khandesh (Banilla) Seed Extension Scheme.*—This scheme, which has for its object the extension of *Banilla* cotton in the Khandesh area, was sanctioned in December 1930 for a period of five years and commenced work in May 1931. Proposals for further extension of the scheme for three years from May 1936 were considered by the Committee but its extension was sanctioned for one year only pending the decision of the Government of Bombay on the condition laid down that a part of the cost of the scheme during the remaining two years should be borne by the Government. As a result of the scheme being in operation during the last five years the cultivation of *Banilla* cotton in Khandesh has extended over an area of 130,000 acres with a production of about 30,000 bales. This cotton is susceptible to wilt and has also deteriorated in spinning quality since its introduction. In spite of these defects, however, it is superior to local cotton and gives better returns. In 1935-36 pure *Banilla* fetched a premium of Rs. 10 to Rs. 15 per *candy* over local cotton. Spinning tests on *Banilla*

cotton carried out at the Technological Laboratory, Matunga, showed that *Banilla* grown on the Bhadgaon Farm gave slightly better results in 1935-36 than in 1934-35 while the same cotton grown on the Dhulia and Jalgaon Farms persistently declined in spinning quality during the last two years. During 1935-36 the Department of Agriculture maintained a controlled area of 20,112 acres and distributed for general cultivation 9,65,000 lbs. of pure seed obtained from the previous year's crop.

76. *The Deccan Canals (Banilla) Seed Extension Scheme.*—This scheme for the supply of pure *Banilla* cotton seed for the Deccan Canals area was sanctioned in January 1934 and started work in April 1934 in the Government Farm at Kopergaon. Unlike other seed schemes this scheme is expected to be self-supporting. Of the sixty acres of farm land taken on lease, *Banilla* occupied in 1935-36 a little over 30 acres, the rest of the area being cropped with Spanish peanut. Cotton suffered considerably from green caterpillars at early seedling stage, and low rainfall and other adverse weather conditions subsequently, and gave a total yield of 22,378 lbs. of *kapas*, i.e. at the rate of 733 lbs. per acre. All the *kapas* was ginned on the Farm and out of the total quantity of 10,700 lbs. of pure, healthy seed obtained, 10,000 lbs. were distributed to cultivators and the balance was retained for sowing on the Farm in the following year. Groundnut gave an average yield of 1,630 lbs. per acre. In the irrigated Deccan Canals areas *Banilla* gives as high an yield as local *N.R.* and fetches a good premium over the local variety. The total area expected to be covered by this cotton is 30,000 acres.

77. *The B.D. 8 Seed Extension Scheme.*—This scheme for the distribution and extension of *B.D.* 8 cotton seed was sanctioned in August 1935 for a period of 3 years and commenced work in December 1935. From a field survey undertaken by the Department of Agriculture at the beginning of the scheme it was ascertained that an area of 3,023 acres was under pure *B.D.* 8 cotton which yielded 474,534 lbs. of pure seed and 252,032 lbs. of lint and the latter fetched a premium of Rs. 40 to Rs. 53 per *khandy* of 784 lbs. of lint over *Broach* cotton. The difficulties in the way of expansion of this cotton are the tendency on the part of buyers to underestimate the value of its lint, its low ginning percentage and the absence of a well organised cotton market for Broach staple cotton. Cultivators, however, are in favour of this cotton because of its high yield of *kapas* and wilt resistance.

Sind.

78. *The Sind Seed Distribution and Extension Scheme.*—The Sind Cotton Extension Scheme commenced in April 1931 and on the expiry of its first sanctioned period of 3 years it was extended for a further period of 5 years. The work of the past five years has definitely proved that the Right Bank area of the Indus is as suitable as any other part of Sind for growing long staple cotton and it is now proposed to pay hereafter special attention to seed distribution, the introduction of better methods of cultivation, and

the extension of cotton in lands under the Barrage area. Cotton cultivation was unknown on this side of the Indus before the commencement of this scheme but as a result of the intensive propaganda carried on by means of field demonstrations, shows, public meetings, etc. the area under cotton has now gone up to 17,000 acres against 4,000 acres in the previous year and 25 acres in 1931-32. During the year under report there were 40 demonstratior plots on the Right Bank area for the comparison of 4-*F* 98 and Sind-*Sudhar* (289-*F* 1) and contrary to the experience of previous years in most cases the latter gave better yields than the former. Sind-*Sudhar* is the better yielder of the two but being a late maturing variety it suffers more than 4-*F* 98 from frost. The year under report was milder than usual and was therefore quite favourable for Sind-*Sudhar*. The sowing date experiments showed that the best time for sowing cotton in this area is from the middle of April to the 30th of May. The Agricultural Department distributed on the Right Bank 3965 *maunds* (326,263 lbs.) of pure seed to the cultivators.

On the Left Bank Sind-*Sudhar* having proved definitely during the past four years to be the best suited for Thar Parkar district and the lower portion of Hyderabad district, the comparative tests of 27 *W.N.* (*Desi*), 4*F*-98, 285 *F*-2 and Sind-*Sudhar* were continued during the year under report in Nawabshah district and the upper part of Hyderabad district only. Sind-*Sudhar* gave the highest yield in Hyderabad district while it closely followed 27 *W.N.* as the second best in Nawabshah district. The chief difficulty in extending high quality cottons like *Sea Island* 2-4 and *Boss III*-16 is the absence of marketing organisation. These two varieties were grown during the year under review on an area of 1,400 acres and they gave an average yield of 7 *maunds* per acre.

The Department of Agriculture have developed a regular system of seed distribution suitable for the conditions of Sind and on the lines of this system they were able to distribute 7,400 *maunds* (608,900 lbs.) of Sind-*Sudhar*, Sind *N.R.*, *Sea Island* and *Boss III*-16 seed. The total area sown to cotton in 1935-36 on the Left Bank was 790,858 acres against 669,100 acres in 1934-35.

Central Provinces and Berar.

79. *The Verum Seed Distribution and Marketing Scheme.*—In November 1929, the Committee sanctioned for a period of one year in the first instance a scheme for the seed distribution and extension of *Verum* 262 cotton and it commenced in September 1930. It was extended annually till the end of July 1934, when it was replaced by a combined scheme sanctioned for a period of 3 years for the extension and marketing of long staple cotton. During the year 1935-36 the Agricultural Department distributed 4,143½ *khandies* (3,248,504 lbs.) of pure seed of long staple varieties sufficient to cover an area of 103,537 acres, whilst 5,594 *khandies* (4,385,696 lbs.) of pure seed, obtained from the seed multiplication area of that year, were

stocked for distribution in 1936-37. The quantity of staple cotton disposed of in 1935-36 amounted to 6,823 bales which fetched an average premium of Rs. 42-9 over *Broach* and Rs. 60-4 over *Oomra*, equivalent to a premium of 20.82 per cent. on *Broach* and 32.26 per cent. on *Oomra* which compares very favourably with the figures obtained in all the previous years since 1930-31 with the exception of 1934-35 when the corresponding premia were Rs. 62-3 and Rs. 82.

United Provinces.

80. *C.* 402 *Seed Distribution Scheme.*—This scheme was sanctioned in January 1934 for a period of five years for the distribution of *C.* 402 seed in the Hardoi, Lucknow and Sitapur districts of the United Provinces and commenced work in May 1935. Though superior to the local cotton this variety requires more careful cultivation and it was therefore decided early in 1935 to restrict its distribution to Madhoganj and Bilgram *tehsils* only where it gives satisfactory results without extra labour and to extend in the remaining areas covered by the scheme another variety, *C.* 520, which is better suited for them than *C.* 402. The latter was grown during the year on an area of about 1,340 acres which gave an average yield of 4 to 6 *maunds* per acre. *C.* 520 was demonstrated on a total area of about 150 acres in 197 localities and the yield obtained varied from 7 to 10 *maunds* per acre.

Hyderabad State.

81. *The Hyderabad Seed Extension Scheme* was sanctioned in November 1929 and started work in March 1930. It was extended for three years in January 1933 and subsequently for a further period of 6 months up to the 31st August 1936. In August 1936 the Committee sanctioned a further extension for 4½ years subject to the condition that at least 50 per cent. of the cost should be met by the State. During the first two years of the scheme *Dharwar No.* 1 and *Gadag No.* 1 seeds were distributed but as a result of the experiments carried out by the Hyderabad Agricultural Department and in view of the fact that the Bombay Agricultural Department had found the *Jayawant* variety more suitable for the neighbouring areas of that province, the distribution of *Dharwar No.* 1 seed was discontinued in 1931-32 in favour of *Jayawant.* During the year 1935-36 the Department of Agriculture maintained a seed multiplication area of 7,000 acres but due to the failure of cotton crop during the previous year in the area covered by the scheme and consequent dearth of pure seed, they were unable to distribute more seed than the quantity required for 41,256 acres. Arrangements have, however, been made to obtain from seed farm areas within the State itself enough pure seed for not less than 35,000 acres in 1937-38 season and purchase the remaining quantity from selected cultivators. The Department of Agriculture have also undertaken to organise the initial stages of seed production in more than one area to minimise the danger of setback in adverse seasons and remain independent of the Bombay Presidency for the supply of pure seed.

BARODA STATE.

82. *The Baroda (Navsari Seed Storage) Scheme.*—This scheme was sanctioned in February 1933 for a period of five years for the rapid spread of 1027 *A.L.F.* in Baroda territory, and started operations in April 1934. Unfortunately the very first year of this scheme was marked by the occurrence of a serious frost which gave a definite set-back to the spread of 1027 *A.L.F.* Owing to the damage to the cotton crop by frost, scarcity of pure seed was apprehended, but the timely step taken by the State Agricultural Department enabled them to secure from different sources 1,350,660 lbs. of 1027 *A.L.F.* seed. Of this quantity 147,555 lbs. were issued for sowing 4,954 acres of the reserved area and the next year 873,239 lbs. were distributed to cultivators. In 1935-36 the reserved area was carefully rogued, the produce obtained from it was ginned under the supervision of the Officer-in-Charge of cotton work and the seed was stocked for distribution in the 1936-37 season. Due to the distribution of pure seed on a large scale there were clear indications that the area under *Goghari* had declined. Throughout the season steady propaganda was continued in favour of 1027 *A.L.F.* and against *Goghari* by the holding of meetings, the distribution of leaflets, etc. The Agricultural Department is making serious efforts to make Baroda independent of the Surat Farm so far as seed supply to cultivators is concerned. It is anticipated that in about two years' time the machinery for ensuring a steady supply of selfed seed of 1027 *A.L.F.* and its multiplication on a large scale will be in full and effective working order.

RESEARCH STUDENTS.

83. The training of research workers in the various branches of the science relating to cotton has claimed the attention of the Committee ever since its establishment. Distinguished graduates are selected and trained in methods of cotton research in recognised institutions in India and abroad or under experienced research workers either on the Committee's schemes, at the Institute of Plant Industry, Indore, at the Committee's Technological Laboratory or under agricultural officers in India. Scholarships are usually awarded for periods not exceeding two years but in deserving cases extensions are granted.

Two categories of scholarships are awarded, *viz.*, training grants and general scholarships. Training grants are intended for Government servants who are recommended by provincial Governments and for Committee servants who are considered suitable. General scholarships are awarded to University Graduates selected by the Research Students Selection Sub-Committee. Applications for these scholarships are invited by advertisement in all leading Indian newspapers.

Fifty-four scholarships and eight training grants have so far been awarded by the Committee ; out of these one scholarship and five training

grants were for foreign study. During the year under report two scholarships and two training grants were sanctioned; six research students were under training—four in India and two abroad.

At its meeting in August 1936, the Committee decided that in future the Director of the Institute of Plant Industry, Indore, might appoint students for training in cotton genetics at the Institute. The scholarships of these students will be paid by the Committee, but the appointments would be subject to confirmation by the Research Students Selection Sub-Committee.

The expenditure on Research Studentships up to 31st August 1936 amounted to Rs. 2,52,354.

P. H. RAMAREDDI,
Secretary.

CHAPTER VI.

ANNUAL REPORT OF THE DIRECTOR, TECHNOLOGICAL LABORATORY, FOR THE YEAR ENDING 31st AUGUST 1936.

In the present report an account will be given of the work done at the Technological Laboratory between 1st September 1935 and 31st August 1936. It will be seen from a perusal of this report that during the year under review the Laboratory not only maintained at the previous high level its service to the agricultural officers in assessing for them spinning values of their prominent strains, but that its resources were utilised to a much greater extent than in the past by the mills who sent their samples for tests and their problems for solution to the Laboratory. The work done at the Laboratory will as usual be described under the following five heads :—

I. Spinning Laboratory.
II. Research Laboratory.
III. Moisture Testing Section.
IV. Publications.
V. General.

I. SPINNING LABORATORY.

The following statement gives a summary of the agricultural samples of different cottons spun and tested at the Laboratory during the period under review together with the names of the suppliers of the samples :—

BOMBAY.

(1) *The Cotton Breeder, S.M.C., Dharwar.*—4 samples of Jayawant ×15 crosses, 2 samples of Dh 1×Dh 2 crosses and one sample each of Gadag 1 and G1×102 E 4.

(2) *The Cotton Breeder, Jalgaon.*—9 samples of Banillas, 7 samples of Local cottons, 3 samples each of N. V. 57-7 and N. V. 56-3, 2 samples of N. R. 6 and one sample of N. V. 56-17.

(3) *The Agricultural Overseer, Padegaon.*—6 samples for irrigation experiments.

(4) *The Cotton Breeder, S.G., Surat.*—4 samples of selections, 2 samples of Segregates and one sample of Surat B.D. 8.

(5) *The Cotton Breeder, Viramgam.*—2 samples of Segregates, one sample each of frost-affected Segregate 4-1 and Wagad 8 and a sample of Wagad Local.

(6) *The Cotton Breeder, Broach.*—3 samples of Selections, 2 samples of B. D. 8 and one sample each of Goghari A 26 and Broach Local.

(7) *The District Agricultural Overseer, Broach.*—1 sample of B. D. 8 (Nabipur).

SIND.

(1) *Botanist in Sind, A.R.S., Sakrand.*—4 strains of 4F-18 × Meade, 2 samples of 4F-98 and one sample each of 289F-1, 285F-2, Ashmouni, Boss III, Sea Island and W. N. 27.

(2) *The Cotton Physiologist, Sakrand.*—6 samples of 285F-2 for manurial experiments, 3 samples each of 289F-1 and 4F-98 for irrigation experiments and 2 samples of Red Leaf 289F-1.

(3) *The Cotton Supervisor, Indus Right Bank, Dadu.*—One sample each of 289F-1 and 4F-98.

PUNJAB.

(1) *The Cotton Research Botanist, Lyallpur.*—19 samples of American Varietal Tests, 15 samples of Desi Varietal Tests, 7 samples of 38F for manurial experiments, 18 samples of 4F for irrigation experiments, 4 samples of D. C. cottons and one sample each of 4F, 289F, 43F and Mollisoni.

(2) *The Deputy Director of Agriculture, Hansi (Punjab).*—One sample each of 1F, 4F, 43F and 289F.

UNITED PROVINCES.

(1) *The Economic Botanist to Government, U.P., Cawnpore.*—5 samples of C 402, 3 samples of C 520 and one sample each of Local, White Flower and Yellow Flower strains.

MADRAS.

(1) *The Cotton Specialist, Coimbatore.*—6 samples of Cambodia strains, 4 samples of new strains, Co. 2 sample from each of Aduturai and Pollachi and one sample each of Karunganni 546, Uppam and Podupathy.

(2) *The Superintendent, Agricultural Research Station, Koilpatti.*—10 samples of C 7 for different experiments, 6 samples of Selections, 5 samples of Koilpatti strains, 2 samples of K.P.T.I. and one sample of Perennial.

(3) *The Farm Manager, Agricultural Research Station, Nandyal.*—2 samples of Gadag (Local and imported), 2 samples of Co. 2 (irrigated and dry) and one sample each of Hagari 1 and Selection 2390.

(4) *The Cotton Assistant, Perundurai.*—1 sample each of Buorbon and Nadam.

(5) *The Agricultural Demonstrator, Dindigul.*—1 sample of dry Cambodia (Kommaripatti).

(6) *The Agricultural Demonstrator, Tadpatri.*—1 sample of Hagari 1.

(7) *The Agricultural Demonstrator, Adoni.*—1 sample of Hagari 1.

(8) *The Agricultural Demonstrator, Guntakal.*—1 sample of Hagari 1.

CENTRAL PROVINCES.—

(1) *The Economic Botanist for Cotton, C.P., Nagpur.*—5 samples of different strains and 4 samples of Bani and Verum strains.

(2) *The Superintendent, Government Experimental Farm, Akola.*—1 sample of Strain 773.

MISCELLANEOUS.—

(1) *The Director, Institute of Plant Industry, Indore.*—13 samples of Malvi selections, 3 samples of Kharva and Musakheri cottons, and 7 samples of Dhar Malvi sub-strains.

(2) *The Cotton Research Botanist, Parbhani.*—7 samples of Gaorani strains, 5 samples of Parbhani strains, 1 sample each of Parbhani American and Havri 3 and one sample each of Gaorani, Gaorani 4 and Gaorani 6 from each of Parhbani, Madhol, Umri, Nanded, Loha and Latur.

(3) *The Crop Botanist, Malva Division, Ujjain.*—4 samples of Malvi cottons, 3 samples of Verums and one sample each of Banilla, Bani 306, B XXI, K 22, G 15, G 16, G 51, Cambodia, C 520, Roseum and Local.

(4) *The Senior Assistant Botanist, Hiriyur.*—2 samples each of M.A.I., M.A. II, and Local Doddahatti and one sample each of Herbaceum 190, Selection 69, Local Sannahatti and Co. 2.

(5) *The Second Economic Botanist to Government, Bengal, Dacca.*—1 sample of 289F cotton.

(6) *The Inspector of Agriculture, Kolhapur.*—1 sample each of Jayawant and Kumpta.

(7) *The Superintendent, Main Farm, Raichur.*—1 sample each of Hagari, Jayawant, Mungari and Local Kumpta.

(8) *The Assistant Botanist, Bukalasa Experimental Station, Bombo, Uganda.*—1 sample each of S. G. 29, N. 17, S. P. 20, and two samples each of B 37 and Local.

The following tables give the distribution of samples, lots and counts spun and tested at the Laboratory in each season since 1924 :—

TABLE I.—*Distribution of samples spun*, 1924-36.

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Bombay	18	26	22	22	28	66	89	69	143	111	97	59	750
Sind	..	..	..	..	..	..	..	..	..	..	..	28	28
Punjab	14	1	..	..	42	30	10	44	55	42	23	71	332
United Provinces	7	..	6	11	9	7	16	7	12	6	7	11	99
Madras	2	19	50	23	30	51	66	15	28	101	30	51	466
Central Provinces	2	..	3	2	2	5	3	3	5	9	9	10	53
Miscellaneous	3	11	..	6	6	27	28	33	75	97	85	100	471
TOTAL	46	57	81	64	117	186	212	171	318	366	251	330	2,199
Standard Cotton Tests	8	54	49	64	33	34	27	18	18	16	18	23	362
Trade tests and Special Tests	..	..	..	..	..	37	89	134	125	166	131	143	825
GRAND TOTAL	54	111	130	128	150	257	328	323	461	548	400	496	3,386

TABLE II.—*Distribution of lots spun*, 1924-36.

Province.	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Bombay	36	52	44	44	53	107	90	69	143	111	97	61	907
Sind	..	..	..	..	..	..	..	..	..	..	..	28	28
Punjab	26	4	..	..	83	41	10	44	55	42	23	71	399
United Provinces	14	..	12	22	18	14	16	7	12	6	7	11	139
Madras	4	38	100	46	60	85	66	16	28	101	30	51	625
Central Provinces	3	..	6	4	4	10	4	3	5	9	9	10	67
Miscellaneous	3	22	..	12	9	33	29	33	75	97	85	100	498
TOTAL	86	116	162	128	227	290	215	172	318	366	251	332	2,663
Standard Cotton Tests	34	176	142	178	68	64	54	36	36	32	36	46	902
Trade Tests and Special Tests	..	..	..	..	..	37	119	186	129	175	175	175	996
GRAND TOTAL	120	292	304	306	295	391	388	394	483	573	462	553	4,561

TABLE III.—*Distribution of Yarns spun*, 1924-36.

Province.	1924–25	1925–26	1926–27	1927–28	1928–29	1929–30	1930–31	1931–32	1932–33	1933–34	1934–35	1935–36	Totals 1924–36
Bombay	103	152	132	132	159	322	253	203	430	332	292	190	2,700
Sind	..	..	..	..	..	..	..	..	..	..	..	84	84
Punjab	106	14	..	..	254	113	31	136	165	127	72	220	1,238
United Provinces	27	..	36	66	54	42	40	22	32	18	21	35	393
Madras	12	108	278	138	180	255	199	53	85	303	90	151	1,852
Central Provinces	8	..	18	12	12	30	12	9	15	27	29	30	202
Miscellaneous	3	58	..	36	27	99	100	93	227	293	250	295	1,481
TOTAL	259	332	464	384	686	861	635	516	954	1,100	754	1,005	7,950
Standard Cotton Tests	95	514	423	447	290	223	309	136	200	180	204	162	3,183
Trade Tests and Special Tests ..	..	..	..	..	..	80	343	502	256	499	810	609	3,099
GRAND TOTAL ..	354	846	887	831	976	1,164	1,287	1,154	1,410	1,779	1,768	1,776	14,232

It will be seen from these tables that as compared with last year the number of samples spun during the period under review shows an increase of 24 per cent. while the lots spun increased by 20 per cent. The number of yarns spun also shows a small increase. Among the samples received from the agricultural departments those sent from the Bombay Presidency, show a substantial decrease, but this is due to the separation of Sind Province as will be seen from the fact that the total for Bombay and Sind, remains practically the same as in the last year. Both the Punjab and Madras, show a very substantial increase in the number of samples sent to the Laboratory for tests, while the United Provinces and Central Provinces sent very nearly the same number of samples as last year. It will be noticed that, inspite of the increase from these provinces, the technological work of the Laboratory was not only maintained at its previous level but even speeded up, as is shown by the fact that special tests were made on 143 samples this year as against 131 samples last year. The number of standard cottons also shows an increase over last year which is due to the necessity, for certain technical reasons, of repeating tests on five of these cottons. It may be mentioned here that the two new cottons from Sind have been given the easy and attractive names of Sind Sudhar and Sind N. R. and it is hoped that these names will prove popular among the trade.

The statement and the tables given above do not include either the small size samples which were received for fibre tests alone or samples of yarns on which tests were made at the Laboratory. A summary of the former will be found on page 69 in this report, while the latter which numbered 73 were tested for mills on payment of fees laid down by the Indian Central Cotton Committee. The small size samples relate to the strains which are as yet in the early stages of experimentation and of which sufficiently large size samples are not available for carrying out spinning tests. When the process of selection, with a view to narrowing down the number of these strains, has proceeded sufficiently far in the light of the results obtained at the Laboratory, the selected strains will be grown

in quantities sufficient for spinning tests which in due course will be made at the Laboratory. In the meantime the Cotton Breeder is guided in his selection work by the results of fibre tests which are made on his strains.

The results of the tests carried out at the Laboratory are embodied in spinning test, fibre test and yarn test reports. These reports are sent to the suppliers of the samples and, in the case of the agricultural samples received for tests at the Laboratory copies of the reports are also forwarded to the supervising officers of the cotton breeders. The cottons supplied by the East India Cotton Association, and the Bombay and Ahmedabad Millowners' Associations, which represent either the fair average samples of the season's crop or its early arrival in the market, are treated in a somewhat different way. The reports of the tests on these samples are published in the form of technological circulars which are distributed freely among the trade and the industry and copies of these circulars are also sent abroad to the principal importing countries of Indian cotton. The following table gives a statement of the number of reports falling under each class which were issued during the period under review together with the corresponding figures for the previous years.

TABLE IV.—*Test Reports issued*, 1924-36.

	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	Totals 1924-36
Spinning Test Reports	7	19	19	22	21	63	92	60	87	121	112	135	758
Fibre Test Reports	1	1	5	1	7	4	7	19	30	18	19	44	156
Yarn Test Reports	..	..	..	1	4	4	2	3	5	3	7	13	42
TOTAL REPORTS ..	8	20	24	24	32	71	101	82	122	142	138	192	956

It will be seen that there is a very substantial increase under all heads in the number of reports issued from the Laboratory during the year under review. The number of fibre test reports was nearly 2½ times of that issued last year, the number of yarn test reports issued was nearly double of that issued last year, while the number of spinning test reports showed an increase of 20 per cent. When it is realised that last year as many as 112 spinning test reports were issued, an increase of 20 per cent. in this figure raises it to the record figure of 135. As a result of this all round increase the total number of reports issued during the period under review rose to 192 from 138 for the last year, which represents an increase of 40 per cent.

Inspite of this substantial increase in the number of samples tested in and reports issued from the Laboratory, the staff of the Laboratory remained practically the same as during the last year. Only two Research Students were added as previous experience had shown that it was wise to have at least one Research Student, in hand to meet the demands from outside on the resources of the Laboratory without seriously dislocating its work. The main burden of the increase in the work of the Laboratory fell on the

old staff who showed commendable zeal in coping with the work especially as during the year the hours of work were increased. The strength of the permanent staff of the Laboratory from year to year since 1924 is given below in the following table :—

TABLE V.

As at August 31 in	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Technical Staff	8	11	20	24	27	27	32	32	32	33	34	34	34
Research Students	1	3	6	4	3	2	1	1	..	..	..	..	2
Fumigation Chemists	..	..	2	4	2	2	2	2	2	2	2	2	2
TOTAL	9	14	28	32	32	31	35	35	34	35	36	36	38

It may be added that it was found necessary, when the rush of samples became great, to employ four temporary junior testers for a period of three months each to enable me to meet the growing demand upon the resources of the Laboratory.

CLASSIFICATION OF SAMPLES.

The samples received for tests at the Technological Laboratory fall under the following four classes :—

(*a*) Agricultural samples.
(*b*) Standard Indian cottons.
(*c*) Trade samples.
(*d*) Technological samples.

We shall now briefly describe the work done under each head :—

(*a*) *Agricultural Samples.*—These samples are mainly supplied by agricultural officers engaged on cotton breeding work in the different provinces of India. They either represent new or improved varieties which are under trial or such samples as are being grown in connection with the various botanical and physiological investigations undertaken by the Agricultural Department. Tests on new varieties are usually made on small samples and are restricted to fibre tests for the first few years. Guided by the results of these tests, only the most promising strains are retained for further experimentation. These are grown in sufficiently large quantities to enable the cotton breeder to send 10 lb. samples to the Laboratory for spinning tests. The spinning tests are usually made for a number of years in order to make due allowance for seasonal variation and finally the most promising variety from the point of view of better yield, fibre-properties, ginning percentage and higher spinning performance is selected for the purpose of multiplication and general cultivation. Among the other category fall those samples which are raised in connection with such investigations as the effect of different manurial treatments, the effect of

different dates of sowing, etc., etc. They are also usually repeated for a number of years to take into account the seasonal variation and at the end of each investigation a final report comprising the results for all the years is also issued to the officer who supplied the samples. Among the agricultural samples subjected to fibre and spinning tests this year at the Laboratory, mention may be made of the following :

(1) *Uganda Cottons.*—As stated in my previous reports, the Indian Central Cotton Committee has agreed to test, free of charge, eight samples of cottons supplied by the Agricultural Department, Uganda. The report containing the results of these tests on the last year's samples was considered by the Technological Research Sub-Committee who recommended that the Department should be asked to include a sample of N. 17 cotton which forms the control for Busoga and Lango districts of the eastern zone. This recommendation of the Technological Research Sub-Committee was conveyed to the Department concerned who accordingly sent a sample of N. 17 cotton along with the other samples.

(2) *Effect of differential irrigation upon the fibre properties and spinning quality of cotton.*—This investigation has been in progress for some time past. The available results were considered by the Technological Research Sub-Committee who recommended that in view of their useful and interesting nature, they should be sent up for publication in a suitable journal. In view of the fact that the effect of differential irrigation on the stand in the field, the shedding of flowers and bolls, the yield per acre, etc., is equally important, it was thought highly desirable that the account of this investigation should be complete with the collaboration of the cotton breeders. Accordingly the cotton breeders concerned were requested to send in their contribution and the bulletin detailing the results of this investigation will be published after the contributions from the cotton breeders have been received. In the current year 33 samples grown with different amounts of irrigation were received from Lyallpur, Padegaon, Sakrand and Coimbatore.

(3) *Tests on long staple Sind cottons.*—In view of the increasing importance of the long staple cottons which can be grown in the new area brought under cultivation in Sind, preliminary tests on two promising varieties, namely Sind Sea Island and Boss III cottons, were made last year and the results were placed before the Technological Research Sub-Committee for their decision as to any further action that may be regarded desirable. The Technological Research Sub-Committee suggested that in the ensuing year tests should be made not only on samples supplied by the Agricultural Department, but also those used by the mills in order to assess the variation in quality that may occur between the grower and the consumer. In accordance with the recommendation of the Technological Research Sub-Committee tests were made during the period under review on five samples of long staple Sind cottons of which two were supplied by the Agricultural Department, Sind, and three by mills and firms using

these cottons. In addition, tests were also made for the purpose of comparison, on three samples of Giza 7 and one sample of Maarad cotton. The detailed report containing the results of these tests was placed before the Technological Research Sub-Committee who recommended that these tests should be repeated for one more season in order to make due allowance for seasonal variation. Accordingly samples of these cottons, as in the past, are being requisitioned both from the Agricultural Departments and from the mills and will be tested in due course.

(4) *Hyderabad Gaorani 4 and Gaorani 6 cottons.*—It has been stated above that in the initial stages of experimentation tests in this Laboratory are generally made on small size samples which are tested for their fibre properties. Subsequently when the field of selection is narrowed down sufficiently, spinning tests are made on moderately large size samples. A good illustration of this useful principle will be found in the case of these two cottons which were tested for the first time in 1930-31, when 35 samples were received for fibre tests. In the following season fibre tests were made only on 14 samples, which gave the best results in the previous year, while in 1932-33 the selection was narrowed down to 6 samples which were grown in sufficiently large quantities to enable the Laboratory to undertake spinning tests on them for the first time. In the following two seasons the number of samples subjected to spinning tests were reduced to three, out of which Gaorani 4 and Gaorani 6 were distributed for district trials at six different centres. In the year under review spinning tests were made on 12 samples of the two cottons grown at different places and a comprehensive report detailing the results of these tests showing differential response of each variety to locality of growth, etc., was sent to the Agricultural Department.

(5) *Hiriyur cottons grown on dry and wet lands.*—Two samples of each of three Mysore cottons, namely M.A.I., M. A. II, and Local Doddahatty, were received for tests. Each pair of these samples was grown under similar conditions with the difference that while one sample was grown under rain-fed conditions the other was raised under irrigated conditions. Fibre and spinning tests were made on these six samples, and it was found that in all cases the sample grown under rain-fed conditions gave a much better performance than the parallel sample grown under irrigated conditions. The results of these tests, which are likely to be valuable to the cultivator, were communicated to the Department in a report with the recommendation that these tests may be repeated in the following season.

(6) *289F Cotton grown in Dacca.*—Although Dacca was at one time famous for its muslin industry, not much cotton is now grown in its environments. During the period under review the Department of Agriculture, Bengal, sent a sample of 289F cotton which was grown in Dacca. The results of tests on this sample showed that it compared very favourably with the 289F cotton grown in the Punjab. This is a promising development and the progress of this cotton in the following seasons will be watched with interest.

(7) *Desi crosses from Lyallpur.*—During the period under review four *desi* crosses from Lyallpur, D.C. 1, D.C. 6, D.C. 7 and D.C. 13, were tested for fibre properties and spinning performance and were found to be much superior to Mollisoni. The best results among them were given by D. C. 13. In order to find out its performance under mill conditions, arrangements were made with a local mill for testing a bale of this cotton which was supplied by the Cotton Research Botanist, Lyallpur. The mill expressed their complete satisfaction with the performance of this cotton which has since been named 'Jubilee' cotton, and supplied a sample of cloth made from it, which was sent to the Cotton Research Botanist, Lyallpur.

(8) *Podupatti cotton from Malabar.*—This is the first time that a cotton has been received for tests from Malabar. It was found suitable for spinning upto 11's standard warp counts and its behaviour in the ensuing seasons will be watched with interest.

(*b*) *Standard Cottons.*—These cottons mostly represent the improved varieties which now cover some 15 per cent. of the total area under cultivation of cotton in India. During the period under review no change was made in the list of standard Indian cottons. As usual, 4-page circulars were issued on the following ten cottons which were received sufficiently early in the season :—

1. Punjab-American 289F.
2. Verum 262 (Nagpur).
3. Verum 262 (Akola).
4. V. 434 (Akola).
5. Late Verum (Nagpur).
6. Umri Bani.
7. Punjab-American 4F.
8. Cambodia Co. 2.
9. Sind Sudhar.
10. Surat 1027 A.L.F.

The bulletin containing the results of tests on all the standard Indian cottons for 1935-36 together with the results for the previous seasons was issued in July 1936.

(*c*) *Trade samples.*—(1) In order to bring the work of the Laboratory into closer touch with the industry and the trade, it has been the practice for some time past to undertake spinning tests on samples of trade varieties of Indian cottons. These samples fall under two heads. Under the first head are included those samples which are supplied by the East India Cotton Association. These represent the fair average quality of different varieties of Indian cottons which form the bulk of the cotton crop and are selected by the Standards Committee of the East India Cotton Association, who also kindly supply their valuation reports. Under the second head fall those samples which are supplied by the mill members of the Bombay

and Ahmedabad Millowners' Associations and which represent the early arrivals of the various Indian cottons into the local markets. These samples are supplied by the mills who also kindly supply valuation reports on their samples. Both types of samples are subjected to a thorough spinning test and the results of these tests are published in 2 or 3-page circulars which are distributed to the trade and industry. Copies of these circulars, containing full information regarding the waste losses, spinning behaviour and yarn characteristics of these cottons, are also sent abroad to countries which import Indian cottons in appreciable quantities. The following statement gives a description of the trade samples which were tested during the period under review :—

Cottons supplied by the East India Cotton Association.

1. Coompta (1934-35).
2. C. P. No. 1.
3. Berar.
4. Khandesh.
5. Muttia.
6. Latur.
7. Nanded.
8. Punjab-American.
9. Kadi-Viramgam.
10. Dholleras.
11. Broach.
12. Jagadia.
13. Surat.
14. Navsari.
15. Kalagin.
16. Farm Westerns.
17. Bijapur.
18. Upland.

Cottons received in accordance with the arrangement made with the Millowners' Associations of Bombay and Ahmedabad.

BOMBAY.

1. Bengals.
2. Khandesh.
3. Ujjain.
4. Mandsaur (Ujjain).
5. Broach.
6. Hubli Kumpta.
7. Hubli Upland.
8. Bailhongal.
9. Karunganni.
10. Kurnool Cambodia.
11. Surat.
12. Navsari.
13. Tiruppur Cambodia.
14. Moglai.
15. African Busoga.
16. African Kampala.
17. African Jinja.
18. Farm Westerns.
19. Miraj.
20. Westerns.

AHMEDABAD.

1. Jagadia.
2. Kadi.

A list of the technological circulars issued on these samples will be found under the head "Publications." Last year it was thought desirable to compile the circulars in the form of a bulletin which should constitute a handy reference book for the users of Indian cottons and should be entitled "Technological Reports on Trade Varieties of Indian Cottons." During the period under review this bulletin was published for the first time and was much appreciated by the public interested in the Indian cottons.

(2) In addition to these tests, the Laboratory continued, as in the past, to receive samples from private mills which were tested on payment of certain fees laid down by the Indian Central Cotton Committee. The scale of fees is given below :—

		Rs.	a.
(1)	Fibre or Yarn Test :—		
	(*a*) Mean fibre-length	7	8
	(*b*) Fibre-weight per inch	7	8
	(*c*) Fibre-strength	10	0
	(*d*) Lea test	7	8
	(*e*) Ballistic test	7	8
	(*f*) Single thread test	7	8
	(*g*) Twist	7	8
(2)	Fibre and Blow-room Test :—		
	(*a*) Fibre tests as for (*a*)—(*c*) above.		
	(*b*) Blow-room only	10	0
	(*c*) Shirley Analyser tests	7	8
(3)	Full Test :—		
	(*a*) Fibre tests as for (*a*)—(*c*) above.		
	(*b*) Spinning test only	35	0
	(*c*) Spinning test on combed cotton	50	0
(4)	Variety of cotton (broad classification)	25	0
(5)	Identification of fibre (microscopic test) ..	15	0
(6)	Percentage of size	7	8
(7)	,, grease	7	8
(8)	,, free acid	15	0
(9)	Presence of mildew	7	8
(10)	Causes of mildew growth	30	0
(11)	Percentage of immature fibres :—		
	(*a*) In lint or *kapas*	10	0
	(*b*) In yarn or cloth	15	0
(12)	Wax content :—		
	(*a*) 1 Sample	12	8
	(*b*) 2 Samples	22	8
	(*c*) 3 Samples	30	0
	(*d*) Each additional sample	7	8
(13)	Determination of mechanical injury to fibre ..	10	0
(14)	Tests in addition to the ordinary 3 roller system (per system) ,, ,, ...	10	0

		Rs.	a.
(15)	Cloth Samples :—		
	(*a*) Actual counts	15	0
	(*b*) Actual twist	20	0
	(*c*) Single thread strength	20	0
(16)	Moisture Tests :—		
	(*a*) 1 Sample	5	0
	(*b*) 2 Samples	7	8
	(*c*) 3 Samples	10	0
	(*d*) 4 Samples	12	8

During the period under review the number of such samples showed a very considerable increase which is a remarkable proof of the growing appreciation of the work of the Laboratory and the utilisation of its resources by the industry. During this period the Laboratory carried out on behalf of various mills and firms spinning tests on 7 samples, fibre tests on 32 samples, yarn tests on 73 samples, moisture tests on 10 samples, shirley analyser tests on 4 samples and blowroom tests on 1 sample, the total number of samples tested for the industry being 127. When it is remembered that last year the number of such samples was 39, the fourfold increase in one year is a striking illustration of the manner in which the industry is consulting the Laboratory more and more every year in the solution for its problems.

(3) *Effect of different degrees of compression on the spinning quality of cotton.*—Following the recommendation of the Technological Research Sub-Committee these tests were performed on four good quality Indian cottons namely, Punjab-American 289F, Surat 1027 A.L.F., Jayawant and Cambodia Co. 2. The report containing the results of this investigation was placed before the Technological Research Sub-Committee at its last meeting and it was decided that it should be published in the form of a bulletin. This will be done.

(4) *Effect of artificial watering on the spinning quality of cotton.*—This investigation has now been brought to a close. The two cottons selected for this purpose were Amraoti and Broach (Palej). The experimental results are now being analysed and a report will be issued in due course.

(5) *Deterioration of cotton stored in the open and in the shed at Karachi.*—The results of this investigation were considered by the Technological Research Sub-Committee who recommended that these should be published in the form of a bulletin. This was done and a summary of the bulletin will be found under the head ' Publications.'

(*d*) *Technological samples.*—These samples are tested and spun at the Laboratory in connection with the various technological investigations which are undertaken here. A brief account will now be given of the more important investigations and the progress made in respect of each.

(1) *Tests with different systems of high draft spinning.*—The Laboratory had already published in the past two bulletins on the application of different systems of high draft spinning to Indian cottons. This work has now been extended by using more systems of high draft spinning. Mixings of cottons prepared from Superfine Oomra, Punjab-American 4F and Cambodia *Co.*. 2 as well as the pure cottons themselves have been spun on 9 different systems. The results of these tests are now available and are being written up in the form of a technological bulletin which will be published shortly.

(2) *The effect of storage on seed cotton prior to ginning.*—Last year a bulletin on this subject was published in the Journal of Textile Institute. The Technological Research Sub-Committee, while considering a summary of the results, recommended that these experiments should be extended to a Kathiawar cotton such as Wagad 8 and that the period of storage should also be extended to four months. Accordingly, in the period under review tests embodying these two recommendations of the Technological Research Sub-Committee were carried out and a report on the results obtained will be published in due course.

(3) *Limit spinning tests.*—In order to study the effect of inserting different degrees of twists on the strength, evenness, appearance, etc., of yarn spun from Indian cottons an investigation was undertaken on these lines. For this purpose yarns were spun from Superfine Oomra and Punjab-American 4F with different twist multipliers ranging from $3\frac{3}{4}$ to $5\frac{1}{2}$. Furthermore, the African cottons A. R. Kampala, A. R. Busoga and A. R. Jinja, received for tests at the Laboratory were also spun with different twist constants. Similarly, the long staple cottons Giza 7 and Sea Island which were used in connection with another investigation were also spun with various twist constants. This investigation is in progress. It is proposed to extend these tests to other cottons in order to make the results and conclusions as comprehensive as possible.

(4) *Effect of different roller settings and twists on the spinning quality of cotton.*—The object of these tests was to find out the best scheme of roller setting and twists in the fly-frames and roller settings in the ring frame which would give the optimum results for strength, evenness, appearance, etc., of yarns. For this purpose Surat 1027 A.L.F., Punjab-American 4F and Cawnpore K. 22 cottons were selected and processed with different twists and roller settings in the fly-frames and spun with different roller settings in the ring frame. The results of this investigation were published during the period under review in a bulletin a summary of which will be found under the head ' Publications.' In continuation of this work it is now proposed to take one cotton, namely Punjab-American 289F, and to spin it from medium, light and heavy card sliver with different schemes of drafts and speeds in the fly frames in order to ascertain the best distribution of drafts and speeds which should give the optimum results for a cotton of this type. This work is in progress.

(5) *Quality of lint in relation to ginning factors.*—It is being realised that considerable damage is done to Indian cottons, especially the long staple ones, by defective or improper ginning and that a systematic study of the best ginning conditions for different types of cotton is highly desirable. In view of this, seed-cotton of nine standard cottons was ginned in a single roller gin with different settings of the moving knife and in a saw gin with different speeds. The lint, obtained under each specific ginning condition, was spun into suitable counts and the yarns were tested for strength, evenness, neppiness, etc. The results of this investigation were published during the year under review in the form of a bulletin, a summary of which will be found under the head 'Publications.' As a continuation of this investigation, *kapas* of two cottons, namely, Cambodia Co. 2 and Karunganni C. 7, has been obtained. Moreover, in view of the increasing importance of the long staple cottons it is also proposed to obtain *kapas* of Sind Sea Island. Further tests with these seed-cottons, employing a wider range of moving knife setting on a full size double roller gin will be made. It is also intended to study the effect of density of feed on the quality of lint. These tests will be made as soon as opportunity permits.

(6) *Tests on mixtures of Indian cottons and staple fibre.*—During the last few years cotton mills in general have been using the newly developed staple fibre in their preparations. In order to find out the suitability of mixing different types of staple fibre with different varieties of Indian cottons tests were undertaken during the period under review on three types of staple fibre which were mixed in different proportions with Cambodia and Jayawant. The pure cottons, the staple fibres and the mixtures were spun into suitable counts and tested for their yarn characteristics. A report containing the results of these tests will be issued very shortly.

(7) *Effect of raising the middle roller on the spinning performance of a cotton.*—It was decided by the Indian Central Cotton Committee that if the results of any tests carried out on behalf of a particular mill are found to be of general interest and if the mill agrees to the publication of such results for general information, the ordinary fees chargeable for the work done by the Laboratory should be waived and the results should be published. During the period under review 16 samples of yarn spun from Sindhi cotton were received from a local mill. These yarns were spun with two different middle roller elevations and with light and heavy middle and back rollers. As it was felt that the results of the tests carried on these yarns might interest the mill industry in general, the permission of the mill was obtained for the publication of these results. The mill in question very kindly agreed to it and a bulletin containing the results of the tests was published during the period under review. A summary of this bulletin will be found under the head 'Publications.'

(8) *Tests on mixings of Indian cottons.*—This investigation forms a part of the programme approved by the Indian Central Cotton Committee. The object of these tests is to find out the relative importance of the various

fibre properties in determining the 'mixing quality' of two cottons. For this purpose tests have hitherto been made on Surat 1027 A.L.F., Superfine Oomra, Punjab-American 289F, Cambodia Co. 2, Broach (Palej), Punjab-American 4F, Jayawant, Khamgaon, Kampala, Punjab-Desi, Raman and Wagad 8. Besides fibre tests, the cottons are mixed according to a plan and the mixtures are spun into suitable counts. This investigation is in progress.

(9) *Effect of humidity on card losses.*—The spinning room of the Laboratory is maintained during the dry season at a relative humidity of 60%—65%. During the monsoon, however, the humidity sometimes rises to about 80%, and there is no means available of bringing it down. As it may happen that a sample may be tested under a high humidity in one year and under ordinary medium humidity in the next year, it was regarded desirable to make some tests under these two conditions of humidities in order to find a basis of comparison for the spinning behaviour in general and the card losses in particular. The tests which were carried out for our own guidance gave some interesting results which it is proposed to publish in the form of a leaflet for general information.

II. RESEARCH LABORATORY.

Fibre Testing Section.—It has been stated above that in addition to the samples on which a spinning test is made, small size samples for fibre tests alone are also received at the Laboratory. These samples are tested in the Fibre Testing Section. One noteworthy feature of the year under review is the fact that the East India Cotton Association sent as many as 52 samples for determination of mean fibre-length. This represents a very large increase in the number of samples tested by the Laboratory for the Association in any one year, and though in this particular year it may have been due to exceptional circumstances, it does emphasise yet another direction in which the work of the Laboratory has found an immediate and useful application and recognition. The following statement gives the distribution of the small size samples on which fibre tests were carried out at the Laboratory during the period under review :—

1. *The East India Cotton Association, Ltd., Bombay.*—52 samples.

2. *The Cotton Research Botanist, Parbhani.*—17 samples of Gaorani strains, 4 samples each of Parbhani strains and Raichur Kumpta and one sample of Kumpta Local.

3. *Senior Assistant Botanist, Hiriyur.*—4 samples each of Nadam and Cernuum crosses, Arboreum and Herbaceum crosses and Natural cross selections and one sample of C×N 86.

4. *The Farm Manager, Nandyal.*—8 samples of selections.

5. *The Cotton Specialist, Coimbatore.*—12 samples of irrigation experiments.

6. *The Cotton Breeder, S. Gujerat, Surat.*—One sample of Segregate.

7. *The Director, Institute of Plant Industry, Indore.*—2 samples of hybrids.

8. *The Director of Agriculture, Baroda State, Baroda.*—2 samples of 1027 A.L.F. cotton.

9. *The Cotton Breeder, Broach.*—6 samples of F3 back crosses, 4 samples of B.D. 8 and Goghari crosses and 1 sample of New Selection 49.

10. *Senior Cotton Asst., Guntur.*—5 samples of strains.

11. *D. R. Vakharia Esq., Broach.*—1 sample of Dakor Farm cotton.

It will be seen from the above statement that during the period under review fibre tests were made on 133 samples, the corresponding figure for last year being 59. Thus, in the current year the number of samples increased by nearly 2½ times as compared with the last year.

As might be expected, the Fibre Testing Section was kept fully occupied in making the tests on the samples mentioned above as well as on those on which spinning tests were made.

Mr. Hari Rao, in addition to supervising the work of this Section, very nearly completed the analysis and writing up of an account of his investigation relating to the effect of twist on the strength and extension of cotton fibre. This investigation has given some extremely interesting results. It has shown that whereas the strength of the individual cotton hair increases in the case of all cottons at first with the insertion of twist and then decreases, the rates of increase and decrease are different for the different cottons and the peak values of strength are attained at lower twists for the shorter than for the longer cottons. It is also found that the left-handed twist has a greater effect in modifying fibre-strength than the right-handed twist of an equal amount, that the contraction of fibres upon the insertion of twist increases rapidly with medium and high twists and is greater for the shorter than for the longer cottons but that the direction of twist does not make any difference to the percentage contraction. Detailed results of this investigation will, it is hoped, be soon published in the form of a Technological Bulletin.

Physics Section.—Mr. R. S. Koshal continued his analysis on the effect of distribution of rainfall and temperature on the fibre-properties and

spinning quality of cotton. During the period under review an analysis of the following cottons was completed :—

Madras	Nandyal.
	Karunganni C. 7.
	Hagari 1.
United Provinces	C. A. 9.
Central Provinces	Verum 262 (Nagpur).
	Verum 262 (Akola).
Bombay	Surat 1027 A.L.F.

The other cottons for which the data are available and are being analysed are Wagad 8, Jayawant and Gadag 1. In view of the great importance of this subject to cotton growers and the very interesting results which have already been obtained, it is proposed to place this subject on the agenda of the First Conference of Research Workers on Cotton which is expected to be held after the next cold weather meeting of the Committee.

Mr. C. Nanjundayya was engaged for part of the period under review for writing up a description of the stapling apparatus which was designed at the Laboratory sometime ago. A bulletin describing the construction and use of this apparatus and containing a summary of the results obtained with it, has been sent for publication in the Journal of the Textile Institute, Manchester. During the remainder of the period, Mr. Nanjundayya continued his investigation on the relationship between the fibre properties and the breaking strength and extension of yarn. This investigation forms a part of the programme of work approved by the Committee and is in progress.

Dr. K. R. Sen continued with his investigation on the relative importance of the various fibre properties in determining the mixing quality of Indian cottons. This investigation also forms a part of the programme of work approved by the Indian Central Cotton Committee and a reference to it, giving an account of the cottons selected for this purpose, has already been made under the head " Technological Samples."

Microscopy Section.—Mr. A. N. Gulati has continued with his investigation on the effect of heredity, environment, irrigation, rainfall, etc. on the maturity of cotton fibre. It was found that very suitable material for this investigation was available from the various farms affiliated to the Institute of Plant Industry, Indore. The Director of the Institute very kindly agreed to supply small samples for the purpose of this investigation. The investigation, however, had to be temporarily suspended owing to the illness of Mr. Gulati which necessitated his absence from the Laboratory for 2½ months.

It will be remembered that an investigation was completed at the Laboratory sometime ago on the relationship between the maturity of cotton fibre and the neppiness of yarn spun from it. In this investigation the method employed for the determination of maturity in cotton fibre, though accurate, was found to be rather slow and tedious. During the period under review an attempt was made to improve this method so that a larger number of tests could be carried out in a much shorter time. This attempt proved successful and a new type of slide, which could be easily fitted on the stage of standard microscope, was designed at the Laboratory. The use of this slide made the work of mounting and counting fibres much less irksome than in the past, and the maturity percentage determination could be made much more quickly without any loss in accuracy of results. A short note describing this new device was sent up for publication to the Journal of the Textile Institute and appeared in the April 1936 issue of the Journal. Several of these slides, manufactured at the Laboratory, have been supplied to the Technological Assistants working in the mofussil laboratories.

Mr. Gulati also made observations on a new type of progressive damage to cotton fibre by micro-organisms. An account of it was published in the Indian Journal of Agricultural Science and a summary of it will be found under the head ' Publications.'

Chemistry Section.—Mr. D. L. Sen remained on study leave during the period under review. He is at present working under Prof. Scholefield at the College of Technology, Manchester, and is due to return on the 20th September 1936.

Dr. Lavji Thoria continued his work on the determination of the cellulose content of different varieties of Indian cottons. The results obtained by him upto November 1935 were considered by the Technological Research Sub-Committee and it was decided that these tests should be made on such short staple cottons as are capable of giving, by virtue of possessing a high yield and high ginning percentage, a large outturn of cellulose per acre. The Directors of Agriculture of the various Provinces and Indian States were requested to ask their cotton breeders to send samples of such high yielding short staple varieties. In response to this request 40 samples were received out of which tests were made on nearly 30 samples. In addition to the testing of these samples, Dr. Thoria has also made tests with a view to finding out if certain modifications in the treatment given to cotton would result either in a substantial improvement in the quality of the films made from it or an appreciable reduction in the cost of the treatment. During the period under review Dr. Thoria brought the first investigation to a close and also did a certain amount of preliminary work with regard to the second investigation. An account of these two investigations will be published in due course.

Mr. G. Rama Rao was appointed Research Scholar on the 20th January 1936 and after the customary training in the determination of physical and

chemical properties of cotton fibre was put on an investigation on the absorption of dyes by Indian cottons at the point where it was left by Mr. D. L. Sen. Mr. Sen in his work had used a method of adding the dye solution to the cotton until the saturation point was reached. Since this method was not only slow but was also subject to personal errors of judgment, a new colorimeter, which employs the photo-electric cell, has been designed at the Laboratory in which the amount of dye left over in the solution is accurately measured. During the greater part of the period covered by this report, Mr. Rama Rao was engaged in erecting and calibrating this new apparatus. The remainder of the period was utilised by him to the examination of the absorption of certain well-known dyes by some of the standard cottons.

Mr. Rama Rao also assisted me in completing an apparatus for recording the direction of wind. A request for an apparatus of this type was made by the Cotton Research Botanist, Lyallpur, sometime ago, who stated that he required it in his work on the study of the effect of wind on cotton crop. This apparatus was designed and completed during the period under review and supplied to the Cotton Research Botanist, Lyallpur.

Mr. M. U. Parmar who was the second Research Scholar selected in the course of this year joined the Laboratory on the 16th January 1936. He was also given the customary training in the methods of fibre and yarn tests. After he received this training, he was entrusted with the investigation on the effect of kier boil treatment on the yarn properties and fibre structure of cotton. The cottons selected for this purpose are Punjab-American 289F, Surat 1027 A.L.F., and Jayawant. Samples of yarn spun from each of these cottons were given different kier boil treatment in the Department of Chemical Technology, University of Bombay. These samples are being tested for strength, extension and chemical damage at the Laboratory, while according to the present arrangement the lustre test will be made by the Department of Chemical Technology.

Mr. Parmar also made a number of tests in connection with the investigation on the effect of raising the middle roller setting to which a reference has been made under the head "Technological Samples."

III. MOISTURE TESTING SECTION.

In the absence of Mr. D. L. Sen, on study leave, Mr. P. S. Sambamurthy, carried out the work of this Section. During the period under review, 24 samples were tested for moisture as follows :—

Appeal Committee	2
Trade	11
Laboratory	11

The total number of samples tested at this Section upto 31st August 1936 is 771.

IV. PUBLICATIONS.

The Brochure entitled "Cotton Research in India" was published in accordance with the recommendation of the Technological Research Sub-Committee during the period under review. I am glad to be in a position to say that this Brochure was very well received by the Presses, the research organisations and the trade and industry connected with cotton. I give below a few of the extracts from the reviews and letters relating to this Brochure.

Textile Manufacturer.—"The Indian Central Cotton Committee though it has—together with the Indian Agricultural Department—great things to its credit, has too many huge problems in front of it to feel much satisfaction, but it can look to its Technological Laboratory at Matunga with pride.....It was a pioneer Institute for in the actual establishment of a Cotton Spinning Laboratory it was in advance of the Shirley Institute or the Egyptian Government.....Collected together, it marks an impressive work of reference. The spinning tests in its next section look both ways; they are tests of cotton on behalf of the breeders and the growers and technological research which serves the users and thus encourage the proper use of and appreciation of the improved Indian cottons.....There is incidental research work which is of great interest and value directly to the cotton spinner."

International Cotton Bulletin.—"Dr. Nazir Ahmad and the Indian Central Cotton Committee are to be congratulated upon the production of a work of exceptional interest."

A Mill.—"On going through, we find the book very useful and we appreciate the work of the Laboratory."

Consul General for Belgium.—"I have sent the same to the Belgian Ministry for Colonies, who, I feel assured, will find this documentation interesting and helpful for their research work in Africa.

Royal Afghan Consulate.—"I congratulate you on this valuable publication and the success that your Laboratory has attained and the services that it is rendering under your leadership to the most important industry in India."

Prof. F. Scholefield.—"Thank you very much for the copy you have sent me of your very interesting report on cotton research in India."

"I have not yet had the opportunity of looking through it, but a mere glance is sufficient to show the great interest of the work, and I ask you to accept my best thanks for your kindness in sending a copy to me."

W. T. Astbury, Esq.—"This is to acknowledge with very many thanks the arrival of the copy of your pamphlet on cotton research in India which you so kindly sent me. You may be sure that I am very pleased indeed to have this."

Commissioner, Ministry of Industries, National Government of the Republic of China.—"I found that this Brochure is of much interest to this Bureau, and have put it in our library for the public to read."

Russell T. Fisher, Esq., The National Association of Cotton Manufacturers, U.S.A.—"I know it will be a valuable addition to the Association Library."

H. A. Hancock, Esq., Cotton Research Board, Giza, Cairo.—"I received your booklet 'Cotton Research in India,' which I have read with very great pleasure; it has not been acknowledged before because I was under the impression that I was reading the Library copy! The volume and the quality of work reflect the great credit on your Laboratory and your Committee's policy of free and open publication make the results of treble value."

In addition to this Brochure, the following publications were issued during the period under review :—

I. TECHNOLOGICAL BULLETINS, Series A Nos. 28 to 34.

1. Technological Bulletin, Series A, No. 28.
"Technological Reports on Standard Indian Cottons, 1935" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

2. Technological Bulletin Series A, No. 29.
"Technological Reports on Trade Varieties of Indian Cottons, 1935" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

3. Technological Bulletin Series A, No. 30.
"The Effects of Storing Cotton Bales in the open and inside a shed at Karachi" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

4. Technological Bulletin Series A, No. 31.
"Quality of Lint in Relation to Ginning Factors" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

5. Technological Bulletin Series A, No. 32.
"The Effect of Employing Different Roller Settings and Twists on the Spinning Performance of three Indian Cottons" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P. and R. P. Richardson, F.T.I.

6. Technological Bulletin Series A, No. 33.
"Technological Reports on Standard Indian Cottons, 1936" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P.

7. Technological Bulletin Series A, No. 34.
"The Effect of Raising the Middle Roller and some other factors on the Yarn Strength of Sindhi Cotton" by Nazir Ahmad M.Sc., Ph.D., F. Inst. P.

II. TECHNOLOGICAL BULLETIN, Series B No. 21.

1. Technological Bulletin, Series B, No. 21.
"A new Method and Apparatus for Determining the Average Length and Fineness of Cotton Hairs" by Nazir Ahmad, M.Sc., Ph.D., F. Inst. P. and C. Nanjundayya, M.Sc.

III. MISCELLANEOUS PUBLICATIONS.

1. "A Device for Mounting Cotton Hairs for Examination of Fibre-Maturity" by N. Ahmad, M.Sc., Ph.D., F. Inst. P. and A. N. Gulati, M.Sc.

2. "A Note on a New Type of Progressive Damage to the Structure of Cotton Hair caused by Micro-organisms" by A. N. Gulati, M.Sc.

IV. TECHNOLOGICAL LEAFLETS.

1. Technological Leaflet No. 5, entitled
"The Influence of Method of Picking on the Quality of Cambodia Cotton."

V. TECHNOLOGICAL CIRCULARS Nos. 196 to 257, as under :—

Circular No.	Title.	Date of publication.
196	Spinning Test Report (No. 624) on samples of Dholleras cotton, 1934-35	September 1935.
197	Spinning Test Report (No. 626) on samples of Westerns cotton, 1934-35	September 1935.
198	Spinning Test Report (No. 627) on samples of Surat Cotton, 1934-35	September 1935.
199	Spinning Test Report (No. 628) on samples of Timevelly Cotton, 1934-35	September 1935.
200	Spinning Test Report (No. 630) on samples of Cambodia Cotton, 1934-35	September 1935.
201	Spinning Test Report (No. 631) on samples of Karunganni Cotton, 1934-35	September 1935.
202	Spinning Test Report (No. 633) on samples of Bijapur Cotton, 1934-35	September 1935.

Circular No.	Title.	Date of publication.
203	Spinning Test Report (No. 634) on samples of Bagalkote Cotton, 1934-35	September 1935.
204	Spinning Test Report (No. 635) on samples A. R. Jinja Cotton, 1934-35	September 1935.
205	Spinning Test Report (No. 637) on samples of A. R. Busoga Cotton, 1934-35	September 1935.
206	Spinning Test Report (No. 638) on samples of A. R. Kampala, 1934-35	September 1935.
207	Spinning Test Report (No. 640) on samples of Kumpta Cotton, 1934-35	September 1935.
208	Technological Report on Punjab American 289F, 1935-36	December 1935.
209	Spinning Test Report (No. 665) on samples of Ujjain Cotton, 1935-36	January 1936.
210	Spinning Test Report (No. 666) on samples of Bengals Cotton, 1935-36	January 1936.
211	Spinning Test Report (No. 667) on samples of Khandesh Cotton, 1935-36	January 1936.
212	Spinning Test Report (No. 670) on samples of Moglai Cotton, 1935-36	January 1936.
213	Spinning Test Report (No. 680) on samples of Ujjain (Mandsaur) Cotton, 1935-36	February 1936.
214	Technological Report on Verum 262 (Nagpur), 1935-36	February 1936.
215	Technological Report on Verum 262 (Akola), 1935-36	February 1936.
216	Technological Report on V. 434 (Akola), 1935-36	February 1936.
217	Technological Report on Late Verum (Nagpur), 1935-36.	February 1936.
218	Technological Report on Umri Bani, 1935-36	February 1936.
219	Technological Report on Punjab American 4F, 1935-36	February 1936.
220	Spinning Test Report (No. 693) on samples of Nanded Cotton, 1935-36	March 1936.
221	Spinning Test Report (No. 695) on samples of C. P. No. 1 Cotton, 1935-36	March 1936.
222	Spinning Test Report (No. 696) on samples of Latur Cotton, 1935-36	March 1936.
223	Spinning Test Report (No. 697) on samples of Punjab American Cotton, 1935-36	March 1936.
224	Spinning Test Report (No. 700) on samples of Muttia Cotton, 1935-36	March 1936.
225	Technological Report on Cambodia Co. 2 (Cambodia 440), 1935-36	April 1936.
226	Spinning Test Report (No. 703) on samples of Navsari Cotton, 1935-36	April 1936.
227	Spinning Test Report (No. 704) on samples of Surat Cotton, 1935-36	April 1936.
228	Spinning Test Report (No. 705) on samples of Bailhongal Cotton, 1935-36	April 1936.
229	Spinning Test Report (No. 706) on samples of Tirupur Cambodia Cotton, 1935-36	April 1936.
230	Spinning Test Report (No. 707) on samples of Broach Cotton, 1935-36	April 1936.
231	Technological Report on Sind Sudhar (289F-1), 1935-36	April 1936.
232	Spinning Test Report (No. 708) on samples of Farm Westerns Cotton, 1935-36	April 1936.
233	Spinning Test Report (No. 709) on samples of Westerns Cotton, 1935-36	April 1936.
234	Spinning Test Report (No. 710) on samples of Hubli Kumpta Cotton, 1935-36	May 1936.

Circular No.	Title.	Date of publication
235	Spinning Test Report (No. 711) on samples of Hubli Upland Cotton, 1935-36	May 1936.
236	Spinning Test Report (No. 712) on samples of Navsari Cotton, 1935-36	May 1936.
237	Spinning Test Report (No. 713) on samples of Surat Cotton, 1935-36	May 1936.
238	Spinning Test Report (No. 714) on samples of Jagadia Cotton, 1935-36	May 1936.
239	Spinning Test Report (No. 715) on samples of Kadi Cotton, 1935-36	May 1936.
240	Technological Report on Surat 1027 A.L.F., 1935-36 ..	May 1936.
241	Spinning Test Report (No. 719) on samples of Dholleras Cotton, 1935-36	June 1936.
242	Spinning Test Report (No. 728) on samples of Broach Cotton, 1935-36	July 1936.
243	Spinning Test Report (No. 729) on samples of Jagadia Cotton, 1935-36	July 1936.
244	Spinning Test Report (No. 730) on samples of Berar Cotton, 1935-36	July 1936.
245	Spinning Test Report (No. 733) on samples of African Busoga Cotton, 1935-36	July 1936.
246	Spinning Test Report (No. 734) on samples of Jinja Cotton, 1935-36	July 1936.
247	Spinning Test Report (No. 735) on samples of Khandesh Cotton, 1935-36	July 1936.
248	Spinning Test Report (No. 736) on samples of Kampala Cotton, 1935-36	July 1936.
249	Spinning Test Report (No. 739) on samples of Miraj Cotton, 1935-36	July 1936.
250	Spinning Test Report (No. 740) on samples of Tiruppur Cambodia Cotton, 1935-36	July 1936.
251	Spinning Test Report (No. 742) on samples of Karunganni Cotton, 1935-36	July 1936.
252	Spinning Test Report (No. 743) on samples of Northern Cambodia Cotton, 1935-36	July 1936.
253	Spinning Test Report (No. 754) on samples of Farm Westerns Cotton, 1935-36	August 1936.
254	Spinning Test Report (No. 755) on samples of Upland Cotton, 1935-36	August 1936.
255	Spinning Test Report (No. 756) on samples of Kadi Viramgam Cotton, 1935-36	August 1936.
256	Spinning Test Report (No. 757) on samples of Bijapur Cotton, 1935-36	August 1936.
257	Spinning Test Report (No. 758) on samples of Kalagin Cotton, 1935-36	August 1936.

Summaries of the Publications issued during the period under review are given below :—

(1) *Technological Bulletin Series A, No.* 30 "*The Effects of Storing Cotton Bales in the Open and Inside a Shed at Karachi.*"—This report contains an account of the investigation carried out to find (1) the extent of the deterioration occurring in the bales kept in the thole-yard in Karachi

taking for purposes of comparison similar bales stored for the same period of time in a shed and (ii) whether the expenditure for erecting godowns in Karachi would be justified by the better results and prices obtained for the bales stored in these godowns. This investigation was extended to the three varieties (1) Punjab-American (2) Punjab-Deshi and (3) Sind-Deshi which form the bulk of the trade cotton received at Karachi. Six bales of each variety were obtained out of which three were placed in the thole-yard, and the other three inside a shed. At the commencement of the experiment, the top hoop of each bale was broken and a representative sample weighing 25 lbs. was drawn from several layers. This was tested in duplicate lots and formed the basis of comparison for the samples drawn on subsequent occasions. The bales were then re-pressed by hand and stored for six months after which representative samples were drawn from one bale of each variety in the shed and the thole-yard. This process was repeated after 12 months' and 18 months' storage, the samples being tested similarly on each occasion. Out of these, the initial tests and those obtained after 12 months' storage referred to early part of the year before the rainy season, while the other two sets referred to the latter part of the year soon after the rainy season. The following conclusions were drawn from the results of these tests :—

1. *Fibre-Properties.*—The fibre-results showed that storage of these cottons for periods extending upto 18 months had no appreciable effect either upon their mean fibre-length or mean fibre-weight per inch. There was, moreover, no indication of any differential response either in respect of the manner of storage (thole-yard or godown) or in regard to the variety of cotton.

2. *Yarn Strength.*—As against the fibre-tests, the yarn-results showed a significant change in the spinning quality of these cottons depending upon the manner of storage. Furthermore, the three types of cotton responded differently to the action of time and the condition of storage.

(i) It was found that if bales of these cottons are stored for some time, either in the thole-yard or in the shed, stronger yarns are obtained, which is due to the atmospheric conditions of humidity and temperature. It should, however, be emphasised that this improvement takes place only in yarn-strength and is off-set to a certain extent by the gradual discoloration and loss of bloom of the stored cotton.

(ii) Keeping the bales in the open in the thole-yard has a very definite harmful effect upon the spinning quality of these cottons, this effect being most pronounced with Punjab-Deshi, less so with Sind-Deshi and least of all with Punjab-American. It should also be stressed that these results do not take into account the loss in colour, bloom, etc., which is over and above that sustained by the cotton in its spinning performance.

3. *Grader's Valuation.*—Both bodies of experts, the Appeal Committee of the East India Cotton Association and the Board of the Karachi Cotton Association, agree that *for each type* of cotton the bales stacked in the thole-yard would fetch a lower price than those stored inside a shed, thereby resulting in financial loss to the merchant, which may amount to several lakhs of rupees.

(2) *Technological Bulletin, Series A, No.* 31:—"*Quality of Lint in Relation to Ginning Factors.*"—The Bulletin describes the results of ginning tests on 9 Indian cottons, ranging in staple length from 0.70" to 0.94" and in mean fibre-weight per inch from 0.109×10^{-6} oz. to 0.269×10^{-6} oz. Each cotton was divided into four lots ; two lots were passed through a saw-gin with saw speeds of 325 r.p.m. and 425 r.p.m., the other two lots were passed through a roller-gin, the overlaps for the shorter cottons being $\frac{3}{8}$" and 4/8" and those for the comparatively longer cottons 4/8" and $\frac{5}{8}$". Each lot was tested for mean fibre-length and spun into two or three suitable counts, the yarns obtained being examined for breaking strength and neppiness. The mean fibre-weight per inch of each sample was determined and fibre-strength tests were made on the different lots of four cottons. From the experimental results the following conclusions are drawn :—

1. The comparatively longer cottons gave a much higher out-turn with the larger than with the smaller overlap. The difference between the out-turns with the two overlaps diminished with the staple length of the cotton, and with the shortest cotton a higher out-turn was obtained with the smaller overlap.

The higher saw speed gave a significantly higher out-turn in the case of all cottons except one. The difference between the out-turns with the two speeds was independent of the staple length of the cotton, but the various cottons showed a differential response in this respect.

2. For a majority of these cottons the greater overlap gave higher ginning percentage. However for cottons possessing a mean fibre weight of nearly 0.150×10^{-6} oz. per inch, the reverse was found to be the case. The use of either of the two saw speeds did not make any appreciable difference to the ginning percentage in most cases.

3. For the short and medium staple Indian Cottons, an overlap of $\frac{3}{8}$" was found to be quite sufficient, while for the comparatively longer types, better fibre results were obtained with an overlap of 4/8". The lower speed was found to be more beneficial from the point of view of staple length of the ginned cotton, especially in the case of the comparatively longer types.

4. The values of the fibre-strength of these cottons were unaffected either by the overlaps or the speeds employed in these tests.

5. The smaller of the two overlaps in the roller-gin and the lower speed in the saw-gin effected, on the whole, a greater degree of cleanliness, thereby giving rise to somewhat smaller waste losses in the blow-room.

6. The differences between the card losses of the various lots of each cotton were insignificant.

7. The number of yarn breakages in the ring frame were, on the whole, found to be fewer, with the smaller than with the greater overlap and with the higher than with the lower speed.

8. On the whole, the lots ginned with the smaller overlap in the roller-gin and the lower speed in the saw-gin gave stronger yarns than the corresponding lots ginned with the greater overlap and the higher speed. This general statement, however, should be supplemented in each case by studying the individual response of the cottons to overlaps and speeds for which detailed results are given in the bulletin.

9. The width of the overlap in the roller-gin and the speed of saws in the saw-gin, within the range employed in these tests, did not make any appreciable difference to the degree of yarn-neppiness in the case of a majority of these cottons.

(3) *Technological Bulletin, Series A, No.* 32:—"*The Effect of Employing Different Roller Settings and Twists on the Spinning Performance of three Indian Cottons.*"—The object of the tests described in this bulletin was to study the effect on the spinning performance of Indian cottons of using different twists in the fly frames and roller settings in the ring frame. For this purpose three Indian cottons, namely, K. 22, P.A. 4F and Surat 1027 A.L.F. were selected, the first being short and coarse, the second short but relatively fine and the third possessing a staple of medium length. The settings and twists normally employed at the Laboratory were taken as standard and these were varied on either side within the practical range.

The mean fibre-length and the fibre-weight per inch of each of the three cottons were determined. Each cotton was processed with the different settings and twists and spun into suitable counts. The yarns obtained were examined for lea breaking strength, single thread strength, evenness, number of neps per yard, etc. The number of yarn breakages sustained by each doffing during the spinning process was recorded.

From the experimental data the following conclusions are drawn:—

1. The two short staple cottons registered fewer yarn breakages in the ring frame with 1/16" than with $\frac{1}{8}$" front roller setting. Among these the finer cotton responded better to the change in settings than the coarser one.

2. The effect on the number of yarn breakages of changes in the settings of the other frames was either small or anomalous. It was clear that these effects were being masked by other factors, pointing to the desirability of further work.

3. Compared to the normal setting of the Laboratory, a closer front roller setting (1/16″ gauge) in the ring frame was decidedly beneficial to the strength of the resultant yarns with the two short stapled cottons ; but was of doubtful value with the medium stapled cotton.

4. By using closer front roller settings both in the ring and the roving frame with reduced twist in the latter machine, the increase in yarn strength was more pronounced especially in the case of the two short staple cottons.

5. As against this, closer settings and reduced twist in the three fly frames effected no change in the yarn strength of K.22 ; a very small improvement in that of P.A. 4F ; and a reduction in that of Surat 1027 A.L.F.

6. Thus, on the whole, closer front roller settings in the rover and the ring frame are definitely advantageous with a short and coarse cotton like K.22 ; somewhat less so with a short but fine cotton like P.A. 4F ; and of doubtful advantage with medium staple cotton like Surat 1027 A.L.F.

7. In order of merit the effect is greatest when a change in the front roller setting is made both in the ring frame and the rover, less so when it is made in the ring frame only and least of all when it is effected in the three fly frames.

8. The effect of opening the front rollers on yarn strength is in the opposite direction to that of closer settings. With this change, the yarns, on the whole, are found to be weaker than with the normal settings of the Laboratory. As would be expected, the loss in strength is greatest when the wider settings are employed both in the rover and the ring frame, somewhat less so when the change is confined to the ring frame, and least of all when these alterations in settings are made in the fly frames.

(4) *Technological Bulletin, Series A, No.* 34: —"*The Effect of Raising the Middle Roller and some other Factors on the Yarn Strength of Sindhi Cotton.*" Sixteen samples of yarns spun in a local mill were tested for strength with the object of ascertaining the influence of the following three factors : (i) the height of the bottom middle roller with respect to the other two rollers, (ii) the weight of the top middle roller, and (iii) the weight of the top back roller. For (i), the bottom middle roller was raised by means of specially constrained roller stands so that its top surface stood respectively 1/32″ and 2/32″ above the tangent to the first and third rollers. For (ii), the weights of the top middle roller employed in these tests were 5 oz., 4 oz.,

3 oz,, and 2 oz. For (iii), the weights of the top back rollers used were 2½ lbs. and 3½ lbs., respectively. The following conclusions are drawn from the results :—

I. *The effect of raising the middle roller from* 1/32″ *to* 2/32″.

(i) The lea-breaking strength of the yarns spun with 2/32″ middle roller elevation lies between 75 to 80 lbs., while that of the yarns for which the rollers were lifted by only 1/32″ is only about 65 lbs. Thus, by a small change in elevation of the middle roller, an improvement of 10-15 lbs. in test was obtained. This improvement is attributed to the better control exerted over the fibres when they are made to adopt a curved instead of a straight path in their passage through the rollers.

(ii) The best strength results were obtained when the ordinary top back roller was used in combination with 2/32″ middle roller elevation, while the heavy back roller in combination with 1/32″ middle roller elevation gave the poorest results.

(iii) The average difference in yarn strength on elevating the middle roller from 1/32″ to 2/32″ became progressively less as the weight of the middle roller was reduced showing that the combination of the lighter top middle rollers with 2/32″ elevation gave, on the whole, stronger yarns.

Both the interactions (ii) and (iii) show that a rigid control of the fibres as represented by a heavy back or middle roller is likely to give weaker yarns than relatively elastic control exerted by a comparatively lighter back or top middle roller.

II. *The effect of using middle top rollers of different weights varying from* 5 *oz. to* 2 *oz.* With 2/32″ middle roller elevation, the use of the comparatively light top middle roller in place of the 5 oz. one affected the yarn-strength one way or another depending upon the weight of the top back roller. But with 1/32″ middle roller elevation the use of the lighter middle rollers gave an increase in the yarn-strength regardless of the weight of the top back roller.

III. *The effects of using ordinary or the heavy back roller*:—

(i) The effect of replacing the ordinary with the heavy back roller is, on the whole, a reduction in yarn-strength, the decrease being greater with the smaller than with the larger middle roller elevation. It appears as if the better control of the fibres resulting from lifting up of the bottom middle roller can neutralise, to some extent, the adverse effect of using a heavy back roller.

(ii) The adverse effect of using the heavy back roller becomes progressively less as the weight of the top middle roller is reduced, the only exception to the rule being the lightest of the four rollers weighing only 2 oz. for which there is a reversal of the effect.

(5) *Technological Bulletin Series B, No.* 21. "*A New Method and Apparatus for Determining the Average Length and Fineness of Cotton Hairs*" —A review of the previous work done on the relationship between the fibre-properties and the spinning value of a cotton indicates that the two properties which contribute mostly to the spinning quality are the mean length and the weight per unit length. Consequently, rapid and accurate methods of determining these two properties should be of immense value not only to the cotton breeder, but also to the trade and Industry. Several methods which are in vogue are briefly reviewed; of these the weight-ratio methods are examined in greater detail in the present paper.

It is shown that the prevalent weight-ratio methods involve the assumption that the variation of weight along the length of a fibre is negligible. This assumption has been found to be invalid by the recent work carried out at the Technological Laboratory and it is shown that if this wrong assumption is made the average length as found by the weight-ratio method is bound to be considerably less than the correct value.

A new method, which remedies the above defect, is described in this paper. The essential features of this method consist in cutting a representative tuft of fibres, with one end in alignment, into three parts; the first part extending to a known length from the aligned end, the second part also having a known length, and the third part containing fibres of different lengths. The three parts are separately weighed. The average length of the third portion is computed by multiplying the ratio of the weight of the third part to that of the first by the known length of the first part. The average length of the whole tuft is obtained by adding up the individual lengths of the three parts. Furthermore, the fibre-weight per unit length may also be determined by counting the number of fibres in the first section prior to weighing and dividing the weight of the tuft by the number of fibres and the average length.

An apparatus, which is designed to carry out the tests accurately and rapidly, is described in this paper. The results of average length determined with the help of this apparatus are given along with those obtained by the older methods, and the agreement is found to be very satisfactory.

(6) *Miscellaneous Publication:*—"*A Device for Mounting Cotton Hairs for Examination of Fibre-Maturity.*"—This note describes a microscopical device which facilitates the examination of the maturity of cotton hairs.

(7) *Miscellaneous Publication: "A Note on a New Type of Progressive Damage to the Structure of Cotton Hair caused by Micro-organisms.*"—While investigating the causes of deterioration of Broach Cotton, a type of damage to the structure of cotton fibre was discovered which does not appear to

have been described by the earlier workers. The chief characteristics of this damage are that (1) it commences from the usual seat of organismal infection, i.e., the basal end or a tear in any other part of the fibre; and (2) it slowly progresses internally disintegrating and corroding the cell-wall, leaving intact merely cuticular sheath. The cell-wall gradually tapers from the unaffected portion into the affected one. Nine photo-micrographs are reproduced in support of the observation.

(8) *Technological Leaflet No. 5. "The Influence of Method of Picking on the Quality of Cambodia Cotton."*—Two samples of Cambodia cotton, grown in Salem (Madras Presidency), from the same seed and under as nearly identical conditions as possible, were tested at the Laboratory. One sample was picked according to the method commonly employed by the local cultivators while the other sample was picked according to the improved method recommended by the Madras Agricultural Department. In the former method the coolies are allowed twice a week usually, to collect the seed-cotton in gunny bags, regardless of whether they are fully ripe or immature. In the improved method, the cultivators are advised to pick the *kapas* only from the fully opened and mature bolls and to leave the locules in the plant itself. This method is not only cheaper and less wasteful than the old one followed by the cultivators, but also yields lint of better quality. The results of the tests carried out on these two samples showed that the sample picked according to the method recommended by the Agricultural Department was superior to the other sample in every respect. It contained a higher percentage of mature fibres, gave 3 per cent. less total loss in the opening and cleaning processes, registered fewer breakages in the ring frame and the yarns spun from it were definitely stronger and less neppy than those given by the sample picked according to the cultivator's method. Thus, the cotton picked by the improved method, had gained *both in grade and quality* and the agriculturists would stand to gain materially by following the method recommended by the Department.

V. GENERAL.

Visitors.—His Excellency the Governor of Bombay very kindly paid a visit to the Laboratory on 6th April 1936. He was received at the Laboratory by Sir Purshotamdas Thakurdas, Mr. Rama Reddi and the writer, who conducted him round the various sections of the Laboratory and showed him the work which was being done in each section. His Excellency evinced very great interest in the work of the Laboratory and put numerous questions regarding the condition of the Indian cottons in general and the application of the Laboratory's results to it in particular. His Excellency's visit was originally planned to last for about three-quarter of an hour, but owing to the deep interest he took it actually lasted for an hour and a half after which he was pleased to express his appreciation of the work seen by him.

The Hon'ble Kunwar Sir Jagadish Prasad, Kt., C.I.E., O.B.E., Member of the Viceroy's Executive Council in charge of the Education, Health and Lands Department visited the Laboratory on the 10th January 1936.

The Hon'ble Chowdhry Sir Mohamed Zafrullakhan, Kt., Member of the Viceroy's Executive Council in charge of the Department of Commerce and Railways visited the Laboratory on the 23rd July 1936.

Among the others who visited the Laboratory during the period under review mention may be made of the following :—

(1) 25 Post-graduate students of the Royal Institute of Science, Bombay.

(2) 52 students and 4 teachers of the Agricultural College, Poona.

(3) 16 students of the Government Textile School, Cawnpore.

(4) Fellows of the Academy and Members of the Reception Committee of the Indian Academy of Sciences.

(5) 15 Research Students of the Physics Laboratory of the Dacca University, Ramna.

(6) 19 First Year B.Sc. students of the Allahabad Agricultural Institute, Allahabad.

(7) 27 students of the Baroda Agricultural School, Baroda.

(8) 15 students of the Kala-Bhavan Technical Institute, Baroda.

The Technological Assistants working at the mofussil laboratories attended the Laboratory with the exception of Mr. S. Rajaraman, Technological Assistant, Lyallpur, in December 1935 for the Refresher Course and the Conference. The Conference of the Senior Members of the Laboratory and the Technological Assistants took place on the 6th and 7th December 1935.

Staff.—Details regarding the technical staff employed in the Laboratory will be found in *Appendix XV*, while leave and other arrangements made during the period under review are mentioned below.

Mr. D. L. Sen proceeded on study leave to join the College of Technology, Manchester, on the 20th September 1935.

Mr. Hari Rao proceeded on leave from the 14th April 1936 to 23rd May 1936 and in his absence Mr. R. S. Koshal supervised the work of the Fibre Testing Section.

Mr. V. Venkataraman, Statistician and Personal Assistant, was given leave on medical certificate from the 9th March 1936 to 12th June 1936 during which period his post remained vacant.

Mr. A. N. Gulati, Microscopist, was on leave on medical certificate from 15th April 1936 to 1st July 1936.

Mr. A. B. Khan, Junior Tester, resigned his post on 3rd September 1936 to prosecute further studies, and Mr. S. N. Rao was appointed in his place.

Mr. S. Raja Raman, Technological Assistant, Lyallpur, completed his training at the Laboratory on the 11th September 1935 and proceeded to Lyallpur to join his duties. Mr. K. G. Deo, who was transferred to Lyallpur to officiate as Technological Assistant, reverted to his substantive post of Junior Tester in the Laboratory.

In order to cope with the increase in the work of the fibre and the yarn testing sections provision for four posts of temporary Junior Testers for a period of three months each had been made in the current year's budget. These posts were filled by the appointment of Messrs. B. N. Prabhakar, S. M. Nawaz, J. S. Deshpande and G. Hurry who worked in the Laboratory from the 2nd December 1935 to 1st March 1936.

As in the past, two students from outside, Messrs. S. Dinakaran and B. V. Vora, were selected for training at the Laboratory from 2nd December 1935 for a period of six months. Their period of training expired on the 31st May 1936.

During the period under review two Research Scholarships were awarded to Messrs. G. Ram Rau and M. U. Parmar and they joined duties on the 20th and 16th January 1936 respectively.

Mr. W. D. Saleem was appointed Junior Tester to fill up the post rendered vacant due to the resignation of Mr. M. R. Raut.

Mr. B. N. Prabhakar was appointed on the 14th April 1936 as Junior Tester to fill up the post rendered vacant due to the resignation of Mr. W. D. Saleem.

Mr. V. Venkataraman continued to hold the temporary post of Personal Assistant in addition to his own duties.

Mr. H. B. Joshi continued to be in charge of the Yarn Testing Section.

The working hours of the Laboratory were increased by one hour from 15th August 1936.

Equipment.—During the period under review the following machines and apparatus were added to the equipment of the Laboratory :—

(*a*) *Machines :*
(1) One Shirley Analyser.
(2) One Fractional H. P. Motor.

(*b*) *Apparatus :*
(1) Leeds and Northrop Galvanometer.
(2) Bosch and Lomb's Euscope with adjustable microscope lamp.
(3) One Protractor eye-piece with adaptor.
(4) Dr. J. Saxl's Evenness Tester.

ACKNOWLEDGMENTS.

It gives me pleasure to express my deep sense of gratefulness to the office-bearers of the Indian Central Cotton Committee for their unfailing support and valuable suggestions, to Mr. Varjivandas Motilal for his kindness in valuing the cotton samples, to the office bearers of the East India Cotton Association and the Millowners' Associations of Bombay and Ahmedabad for their help in supplying samples of trade varieties. My best thanks are also due to the staff of the Laboratory for their loyal co-operation and many fruitful suggestions which made it possible for me to complete the work described in this report.

NAZIR AHMAD,
Director,
Technological Laboratory.

Dated the 24th November 1936.

CHAPTER VII.

REPORT OF THE PUBLICITY AND PROPAGANDA OFFICER FOR THE YEAR ENDING 31st AUGUST 1936.

INTRODUCTION.

THE Indian Central Cotton Committee's Publicity and Propaganda Department has made steady progress during the period covered by this Report, in interpreting and broadcasting to the public, both in India and abroad, the facts and recommendations arising out of the scientific research work carried on under the auspices of the Committee. The Department has directed its efforts along two main channels ; firstly, wide press publicity both in India and abroad for disseminating knowledge of improvements effected in the quality of Indian cottons ; and secondly vigorous field propaganda by the Publicity Officer in person in collaboration with Provincial Departments of Agriculture, in furtherance of regional campaigns for dealing with specific cotton problems. Under the first category fall the Committee's varied schemes both scientific and practical so that the interested public could lay its hands on them quickly and easily. In the second group are included propaganda tours in different provinces of India to carry the fruits of experimental work to the grower and other interests concerned.

ANTI-*GOGHARI* PROPAGANDA.

The notable event during the year under report was a determined drive initiated by the Department of Agriculture, Bombay, with the Committee's active co-operation to eliminate the inferior cotton known as *Goghari* from the Surat tract. This type of cotton has been found to be undesirable not only in itself but also because it is mixed with superior varieties, thereby spoiling the reputation of one of the finest Indian cotton, *Navsari* 1027 *A.L.F.* The united efforts of the Department of Agriculture, Bombay and the Indian Central Cotton Committee to eradicate this inferior variety of cotton from the Surat tract met with only partial success. The main factor which stood in the way of complete success was the higher ginning percentage of the inferior variety. The trader encouraged mixing of the two varieties so as to be able to palm off the mixture as genuine *Navsari*.

To put an end to this evil practice of mixing, legislative prohibition for cultivation of *Goghari* was considered the only means. The Bombay Government accordingly brought forward the bill to prohibit the cultivation of *Goghari* cotton and the mixing of such cottons with other cottons, etc., etc., which has since become law.

In the work of securing the support of the members of the Bombay Legislative Council for the measure, the Publicity Department played its part. An illustrated pamphlet, a hand bill and a special article were prepared and distributed to the members at Poona and at the extended session of the Council in Bombay.

A special demonstration was staged in a large *shamiana* in the compound of the Council Hall at Poona. Samples of 1027 *A.L.F.*, *Goghari* and mixed *kapas*, yarn exhibits, etc., prepared at the Committee's Technological Laboratory at Matunga, were placed on view, together with Baer patterns of 1027 *A.L.F.*, *Goghari* and mixture, combed halos of 1027 *A.L.F.* and *Goghari* and photos, charts, graphs, diagrams, pictures, etc., showing the characters and monetary value of the two varieties as well as of their mixture. The demonstration was organised in a manner calculated to please as well as instruct at a time when the session of the Legislative Council was in progress and was acknowledged to be a source of enlightenment and profit to the members representing agricultural, trade and industrial interests.

A similar demonstration, although on a smaller scale, was held at the extended session of the Council in Bombay which finally passed the measure into law.

The *Times of India*, the *Bombay Chronicle* and local vernacular papers evinced great interest in this important measure and published a special article on the subject. The *Times of India* made appreciative editorial comments upon the Publicity Department's unceasing campaign for educating the members of the Council on the urgent need for the measure.

Following on the passage of the Bombay Cotton Control Bill of 1935 and a similar bill penalising *Goghari* cotton in Baroda and in pursuance of the decision taken by the Committee at its 32nd meeting to pursue propaganda work against *Goghari* in the district of Surat and Navsari *Prant*, the Publicity Officer devoted a large portion of his time in the preparation of illustrated pamphlets, the anti-*Goghari* poster "Get rid of the weight", placards, etc., to help forward the campaign and extend it to villages. Rightly alert to the much desired elimination of inferior *Goghari* the officers of the Agricultural Departments of Bombay and Baroda had before the big drive was launched carried on in the past the educational work in territories south of Nerbudda river, from Ankleshwar to Bilimora, Vyara and Anawal in the Surat district and in the Navsari *Prant* in the Gaekwar's territory, inducing cultivators to grow the pure 1027 *A.L.F.* type, in wake of the pioneering attempts of Sir Purshotamdas Thakurdas, Vice-President of the Indian Central Cotton Committee, who was the first to stress the need of putting a complete stop to the growing of *Goghari* and to seek Government's co-operation in enforcing measures to that effect. But in spite of it, *Goghari* assumed alarming proportions in some villages of Jalalpur Taluqa and Navsari *Prant*.

Supplementing the above efforts, the Publicity Officer of the Indian Central Cotton Committee, accompanied by the Cotton Superintendent, Surat, and Cotton Officer, Navsari, and the staff, carried out a campaign of propaganda, visited a large number of centres and villages in the British and Baroda territories, addressed meetings of growers and interviewed ginowners, merchants, commission agents and export firms, to unify the thinking and action, acquainting them with facts about *Goghari*, the disadvantages of mixing the two varieties, the necessity for checking the evil, provisions of the Acts and their basic objects designed to improve the economic condition of the interests concerned by increasing the net return for cotton which was their mainstay and brought them more than 30 lakhs of rupees per year for their output of 1½ lakhs of bales from the cotton tract South of Nerbudda river ; the work of the Indian Central Cotton Committee's schemes to improve and develop cottons in Surat and Baroda and their active co-operation in its endeavour to establish the reputation of the *Navsari* cotton which was highly prized in India and abroad for its fine long staple.

The task of getting the cultivators to stop growing *Goghari* was colossal. It meant the displeasure of ginning interests, the formulation of a new policy, giving actual effect to it and the broad principle involved. One of the most important steps was to plan and get under way far reaching propaganda campaign, designed to reach every grower and ginner of *Goghari* whom it was possible to reach, and to convince them of the advantages of keeping 1027 *A.L.F.* pure.

By giving talks, by issuing literature, displaying posters, distributing placards, and by personal interviews and other available mediums, public opinion in favour of the measures was successfully mobilized which contributed towards better understanding of the concerted action of the Departments of Agriculture and the Indian Central Cotton Committee even in remote villages.

The co-operation of the Press to help forward the campaign in the districts was again noteworthy. Interviews to the press correspondents were given and these resulted into the *Times of India* reproducing poster "Get rid of the weight" twice with a descriptive note regarding the poster and an account of the work which was being done in Surat and Baroda for the improvement of cotton.

The *Gujerati* of Surat and *Sayaji Vijaya*, an official organ of Baroda State, besides reproducing the poster wrote leading articles in support of the campaign. An account of the activities of the Committee's Publicity and Propaganda Officer in affected areas was also published.

Literature was supplied to the Press and by these means a good press and general publicity was secured.

The programme of the campaigns was immediately successful and the response from the interests connected with cotton was very fine and encouraging.

EXHIBITIONS.

There are no better mediums than exhibitions and fairs in the civilised countries all over the world as the most effective and important means of knowing how far and in what manner the industries and commerce of a nation are able to meet the demands of its life ; whether articles manufactured for the use of a people are of a right quality and type.

One such notable exhibition in which the Publicity Department of the Committee participated was the Rural Life Exhibition at Baroda which lasted for two weeks commencing from the 1st January, 1936. This Exhibition was organised in celebration of the Diamond Jubilee of H. H. the Maharaja of Bardoa, and represented a true picture of life springs of agricultural, commercial and industrial development made in that part of the country and an object lesson for the systematic dissemination of those facts which are of the greatest value to the producer, the consumer and the distributor.

The exhibition attracted thousands of visitors, farmers, merchants, manufacturers and members of every class of society.

Occupying as it did an extensive *maidan*, the exhibition was able to accommodate hundreds of stalls. Side by side with the show of the Agricultural Department the stall of the Indian Central Cotton Committee was organized in a striking manner to fulfil a mission of no small significance, namely, to make known to the public the eminent part the Indian Central Cotton Committee was playing in the agricultural and industrial advancement of the country. A number of cotton exhibits kindly placed at the department's disposal by the Director of the Technological Laboratory, a large number of photos and charts showing the superiority of 1027 *A.L.F.* cotton over *Goghari*, posters and other publications of the Publicity Department were on view at the exhibition. The Committee's participation was a great success and numerous comments were heard from cotton interests and the general public who thronged the stall, that so noticeable an improvement has already been achieved in the quality of cotton and that such great schemes were being financed by the Committee for the extension of improved varieties of cotton. In fact, the Publicity Stall, without exaggeration, proved to be a great educational agency in the dissemination of knowledge of the Committee's outstanding activities at a comparatively small cost. In appreciation of the good propaganda work done by the department the Exhibition Committee granted a certificate to the Committee.

2. *All-India Industrial Exhibition, Delhi.*

A sufficient number of posters, pamphlets and other publications which were considered to be of use in Northern India were sent for use in the exhibition. The Publicity Officer who at the time was engaged in the preparation of propaganda material for Surat and Baroda campaigns was

unable personally to take part in the exhibition. The Secretary of the exhibition in a letter on the usefulness of posters and literature of the department said "The posters were interesting and always there was a big crowd at places where the posters were displayed. The literature also seemed to have effected good results because it contained valuable information and people liked to receive the literature with great interest."

3. *The Fair in Rajputana.*

At the request of the Extension Officer of the Institute of Plant Industry, Indore, Publicity and Propaganda literature and posters of the Publicity Department were supplied for demonstration and distribution purposes at the fair.

Crop Demonstration in Amraoti and Yeotmal.

At the request of the Extra Assistant Director of Agriculture, Amraoti, suitable propaganda literature was sent to him for use in connection with the demonstration of improved crops held in Amraoti and Yeotmal districts.

4. *Fairs and Demonstration in Warora, Central Provinces.*

Publications of the Department were also supplied to (1) the Agricultural Assistant, Warora, Central Provinces, and (2) the Deputy Director of Agriculture, Gujerat, in connection with village uplift work in several villages which were visited by H. E. the Governor of Bombay.

PRESS *COMMUNIQUES.*

The following press *communiqués* were issued during the year under report :—

1. *Elimination of Goghari cotton from Surat tract.*
2. *Development of cotton cultivation in Sind.*
3. *Combing of good quality Indian cottons.*
4. *Development of cotton growing in Bombay Presidency.*
5. *Facilities for training at the Technological Laboratory, Matunga.*
6. *Amalner Cotton Market.*
7. *Fibre-maturity in relation to fibre and yarn characteristics of Indian cottons.*
8. *The 31st Half-yearly meeting of the Indian Central Cotton Committee.*
9. *The 32nd Half-yearly meeting of the Indian Central Cotton Committee.*
10. *Improved varieties of cotton in Sind and their cultivation.*
11. *Review of last year's developments.*
12. *Seed distribution and extension schemes.*
13. *Improvement of cotton in India.*
14. *Review of the brochure on cotton research in India.*
15. *Effects of storing cotton bales in the open and inside a shed at Karachi.*

SPECIAL ARTICLE.

Elimination of Goghari cotton from Surat tract :—This special article was issued to bring home to the members of the Bombay Legislative Council, the agriculturists in Surat and the trade in general the necessity for the eradication of *Goghari* cotton from the Surat tract, in view of the great damage done to the reputation of the superior variety 1027 *A.L.F.* by the mixing of both the varieties and passing the mixture off as genuine *Navsari* cotton. Legislative intervention was the only means of salvaging the reputation of the *Navsari* cotton.

PAMPHLETS.

In addition to press *communiqués* and special article, the Publicity and Propaganda Department published pamphlets, leaflets, etc., setting forth results of study of a number of cotton problems. The pamphlets issued were :

1. "*Elimination of Goghari from the Surat tract will re-establish the reputation of Navsari cotton.*

This pamphlet explains the superiority in quality and value of *Navsari* 1027 *A.L.F.* cotton as compared with *Goghari*, the disadvantages of mixing these two varieties and the views on the question of those affected by the evil of mixing. This pamphlet was specially prepared in connection with the anti-*Goghari* propaganda campaign launched by the department, when the question of elimination of *Goghari* cotton from the Surat tract was before the Bombay Legislative Council.

2. A Gujerati version of this pamphlet was also brought out for propaganda in the Baroda State.

3. "*Spotted Boll-worms* (*Earias Fabia insulana*) *in South Gujerat.*"

This is a popular thoroughly illustrated edition of the bigger scientific monograph published by the Imperial Council of Agricultural Research. This deals with the results of the Surat Entomological Scheme and describes the investigations made from 1923 to 1934 on the Spotted Boll-worm in South Gujerat in order to study the life and habits of this important pest of cotton and the estimation of damage caused by it. It also includes a summary of the clean-up campaign organized in the Broach district to determine the efficiency of control measures.

4. "*The Indian Central Cotton Committee, its objects, activities and achievements.*"

This pamphlet gives a comprehensive description of the Committee's varied activities and its achievements in the legislation designed to promote the production, marketing and manufacture of Indian cottons and in the sphere of research.

In order to reach a wider public, this pamphlet was translated from English into the provincial languages such as Marathi, Gujerati, Urdu, Hindi, Tamil and Telugu.

5. *"Summary Proceedings of the 32nd meeting of the Indian Central Cotton Committee."*

This was an impersonal summary setting forth the main points brought out during discussions without mentioning the names of the speakers.

6. A handy illustrated pamphlet is under print, setting forth the aims and achievements of the Indian Central Cotton Committee, for distribution during the forthcoming United Provinces Industrial and Agricultural Exhibition at Lucknow.

POSTERS.

'Get Rid of the Weight.'

The four-coloured poster was specially prepared to help forward the campaign for the elimination of *Goghari* from the Surat and Baroda tracts. It is a vivid picturization of the handicap which *Goghari* constitutes to the cultivators' efforts to obtain better prices for his product. It lends point to the exhortation to get rid of the short staple variety of cotton grown in Surat and Baroda which is greatly responsible for the deterioration in the quality of 1027 *A.L.F.*

The preparation of a suitable poster for *B. D.* 8 cotton in Gujerati was also taken in hand.

The idea of replacing the poster *"India's bid for Supremacy in world's Cotton Markets"* with a different attractive design and latest available figures was also taken in hand. To cope with the immediate demand for this poster a number of copies of the old edition was brought up-to-date and printed.

LEAFLETS.

The Gujerati leaflet on the uses of plant puller was reprinted a third time to meet increased demand from Baroda and other places.

HANDBILLS.

1. The Plant Puller handbill was also reprinted a third time in Gujerati in order to meet heavy demand from the Director of Agriculture, Baroda.

2. "*Save Indian Cottons.*"

The handbill was prepared in connection with the efforts made by the Publicity and Propaganda Department to eliminate *Goghari*. A Gujerati version, with necessary modifications, was also prepared in connection with a similar campaign proposed to be conducted in Baroda.

PLACARDS.

A placard explaining the gist of legislative measures prohibiting the growing of the *Goghari*, and directing the growers to obtain pure seed of 1027 *A.L.F.* from nearest Government Depôts was also prepared in English and Gujerati.

DEMAND FOR PUBLICITY LITERATURE AND GREATER NUMBER OF ENQUIRIES.

The year now under review was remarkable for an increased demand for the publications of the Department as well as for special information bearing on the Committee's work. A large number of enquiries from Government institutions, trade associations, private concerns and interested individuals were attended to. Its help was sought for information on scientific investigations, based on the latest knowledge of marketing and other problems in connection with the improvement and export of Indian cotton. These enquiries encouraged the belief that the widening of the informational service has attracted increasing attention from both the trade and the general public, here and abroad.

PUBLICITY OFFICER'S TOURS.

During the year under report the Publicity and Propaganda Officer paid visits to Poona, Surat, Baroda and Navsari and toured through many centres of the Surat district and Navsari in connection with the Anti-*Goghari* campaign. Such journeys helped him to keep in touch with cotton interests and opinions and by virtue of his office also to contribute towards a better understanding of the Committee's work for the improvement of cotton in India, carry on field propaganda in the districts, and to offer them the services of the Department in this respect. With the help of the Officers of the Department of Agriculture, Bombay and Baroda, the Publicity and Propaganda Officer followed a rationally adjusted working plan for the campaigns that made the most effective success, as reflected in the earlier pages of this report.

APPRECIATION OF COMMITTEE'S WORK.

In assessing the value of the Committee's work, several newspapers, both in India and outside, have from time to time written in appreciative terms. For instance, the *Times of India*, commenting on His Excellency

the Governor's address at the 31st half-yearly meeting of the Indian Central Cotton Committee in which His Excellency referred to Lancashire's readiness to make more use of Indian cotton, if uniformity in quality was assured, observed as follows :

> "to this persistent publicity and propaganda are essential ; the Indian Committee are awake to this need. Its Publicity and Propaganda Department has been instrumental in checking to some extent the evils formerly prevalent in the cotton trade. Particularly successful was its campaign for the elimination of the boll-worm pest in Surat, which adversely affected the quality of the local crop. Its task will be considerably lightened by the legislative measures shortly to be undertaken, and the result should be an appreciable improvement in both the quality and quantity of Indian cotton supplies. That in itself must justify the existence and labours of the Indian Central Cotton Committee."

His Excellency the Governor of Bombay, while addressing the 33rd half-yearly meeting of the Indian Central Cotton Committee on August 18, 1936, made reference to Publicity and Propaganda work of the Committee in the following terms : "Through its propaganda agency your Committee with the immense authority of its store of knowledge and experience wields a great power for the improvement of the cultivation and trade of this Presidency. Bombay is above all the cotton province of India and any improvement in production, marketing or export will benefit a very large section of the population. The difficulty in the way of improvement is very largely that of convincing growers and traders of the resultant benefits. The cultivator is naturally conservative ; it is indeed hardly reasonable to expect him to display much individual originality and initiative. Demonstration and propaganda are necessary to convince him that it pays in the long run to spend more on better seed, to root up old cotton stumps and to keep cotton free from admixture of inferior kinds and of dirt and rubbish. The Committee is admirably equipped for this purpose and has already done much by bringing home directly to the guilty party any departure from the specified standard of quality in cotton bales."

R. D. MIHRA,
Publicity and Propaganda Officer.

APPENDIX I.

MEMBERS OF THE COMMITTEE.

(1) PRESIDENT.—

Sir Bryce Burt, Kt., C.I.E., M.B.E., I.A.S., Offg. Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS.—

Madras	M.R.Ry. Rao Bahadur D. Ananda Rao Garu, I.A.S.
Bombay	The Director of Agriculture.
United Provinces	Mr. J. H. Ritchie, I.A.S., Director of Agriculture.
Punjab	The Director of Agriculture.
Central Provinces	Mr. J. C. McDougall, I.A.S., Director of Agriculture.
Burma	Mr. F. D. Odell, I.A.S., Deputy Director of Agriculture, West Central Circle, Magwe.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS—

The East India Cotton Association ..	Sir Purshotamdas Thakurdas, Kt., C.I.E., M.B.E. (*Vice-President*).
The Bombay Millowners' Association ..	Mr. S. D. Saklatvala, M.L.C.
The Bombay Chamber of Commerce ..	Mr. M. S. Durutti.
The Indian Merchants' Chamber ..	Mr. Chunilal B. Mehta.
The Karachi Chamber of Commerce ..	Mr. A. P. Darlow.
The Ahmedabad Millowners' Association .	Seth Sakarlal Balabhai, M.L.C.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce .	Mr. J. Tinker.
The Empire Cotton Growing Corporation.	Mr. W. Roberts, C.I.E.

(5) AND (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS—

Central Provinces	Mr. Y. G. Deshpande. Mr. D. K. Kane.
Madras	Mr. J. Nuttall.
Punjab	Khan Bahadur Sardar Habibullah, M.L.C.
Bengal	Mr. Akhil Bandhu Guha.

(7) CO-OPERATIVE BANKING REPRESENTATIVE—

Sir Chunilal V. Mehta, K.C.S.I.

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY—

Madras	Mr. K. S. Ramaswami Gownder. M.R. Ry. Rao Bahadur B. P. Sesha Reddi Garu, M.L.C.
Bombay	Sardar Rao Bahadur Bhimbhai Ranchodji Naik, M.L.C. Rao Bahadur C. S. Shirahatti.
United Provinces	Khan Bahadur Shah Nazar Husain, M.L.C. Rai Bahadur Lala Anand Sarup, M.L.C.
Punjab	Sardar Sahib Gurbachan Singh, M.L.C. Mian Nurullah, M.L.C.
Central Provinces and Berar ..	Rao Bahadur M. G. Deshpande, C.B.E. Mr. M. P. Kolhe, M.L.C.

(9) AND (10) REPRESENTATIVES OF INDIAN STATES—

Hyderabad State	Mr. Nizam-ud Din Hyder, Director of Agriculture.
Baroda State	Mr. R. G. Allan, C.I.E., Commissioner of Agriculture.
Gwalior State	Mr. H. H. Pandya, Director of Agriculture.
Rajputana and Central India States.	Vacant.*

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL-IN-COUNCIL—

1. Mr. D. N. Mahta, Economic Botanist for Cotton, Central Provinces.
2. Rao Bahadur S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
3. Dr. V. K. Badami, Ph.D., Deputy Director, Department of Agriculture in Mysore State, Bangalore.
4. M.R.Ry. V. Ramanatha Ayyar Avl., Cotton Specialist, Coimbatore.
5. Musahib-i-Khas Bahadur S. V. Kanungo, Finance Minister, Holkar State, Representative of the Holkar State.
6. Mr. W. J. Jenkins, I.A.S., Chief Agricultural Officer in Sind, Karachi.
7. Seth Isserdas Varindmal, Representative of the Karachi Indian Merchants' Association.
8. Mr. P. B. Richards, I.A.S., Entomologist to Government, United Provinces.
9. Mr. Sayed Miran Muhammad Shah, M.A.C., 50, Cantonment, Hyderabad, Sind.
10. Khan Saheb Farrukhbeg Sadikalibeg Mirza, Nawabshah, Sind.
11. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.
12. Mr. Chellaram Shewaram, Representative of the Karachi Cotton Association, Ltd.
13. Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

* Since filled in by Mr. T. R. Low, I.A.S.

APPENDIX II.

CONSTITUTION OF SUB-COMMITTEES.

Standing Finance Sub-Committee.

Sir Bryce Burt (*ex-officio.*)
Sir Purshotamdas Thakurdas (*Chairman*)
Mr. S. D. Saklatvala
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Mr. J. Vonesch.
Mr. Chunilal B. Mehta.
Mr. A. P. Darlow.
Sir Chunilal V. Mehta.
Mr. M. S. Durutti.

Local Sub-Committee.

Sir Bryce Burt.
Sir Purshotamdas Thakurdas.
Mr. S. D. Saklatvala.
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Mr. J. Vonesch.
Mr. Chunilal B. Mehta.
Mr. A. P. Darlow.
Sir Chunilal V. Mehta.
Mr. M. S. Durutti.

Cotton Ginning and Pressing Factories Sub-Committee.

Sir Purshotamdas Thakurdas.
Mr. S. D. Saklatvala.
Mr. J. Vonesch.
Mr. Chunilal B. Mehta.
Mr. J. Tinker.
Mr. J. Nuttall.
Mr. W. Roberts.
Mr. Y. G. Deshpande.
Vacant (two seats.)

The Co-operative Banking Representative—Sir Chunilal V. Mehta, and Mr. Chellaram Shewaram—(*Co-opted Member.*)

Agricultural Research Sub-Committee.

I. *The President.*—Sir Bryce Burt.

II. *The Vice-President.*—(ex-officio.)

III. *The Director, Institute of Plant Industry.*—(ex-officio.)

IV. *The Co-operative Banking Representative.*—Sir Chunilal V. Mehta (ex-officio.)

V. *Cotton Growers' Representatives.*—Mr. W. Roberts; Mian Nurullah; Vacant. (one seat).

VI. *Cotton Trade Representatives.*—Mr. Chunilal B. Mehta; Vacant (one seat.)

VII. *Agricultural Officers.*—Dr. W. Burns; Mr. J. H. Ritchie; Mr. H. R. Stewart; Mr. V. Ramanatha Ayyar; Mr. R. G. Allan; Mr. W. J. Jenkins; Rao Bahadur D. Ananda Rao Garu, Mr. D. N. Mahta; Mr. P. B. Richards; Mr. J. C. McDougall; Mr. Nizam-ud Din Hyder; Mr. H. H. Pandya; Dr. V. K. Badami; Vacant (one seat.)

VIII. *Co-opted Members.*—Mr. Mohammad Afzal; Rai Saheb Kalidas Sawhney Mr. J. B. Hutchinson; Mr. Chellaram Shewaram, and

IX. *The Secretary.*

TECHNOLOGICAL RESEARCH SUB-COMMITTEE.

The President (*Ex-officio.*)
Sir Purshotamdas Thakurdas.
Dr. W. Burns.
Mr. H. R. Stewart.
Mr. Chunilal B. Mehta.
Seth Sakarlal Balabhai.
Rao Bahadur D. Ananda Rao Garu.
Mr. S. D. Saklatvala.
Mr. J. Tinker.
Mr. M. S. Durutti.
Mr. Y. G. Deshpande.
Lala Shri Ram.
Mr. N. Brodie (*Co-opted.*)
Dr. Nazir Ahmad.
Vacant (one seat.)

Mr. A. D. Walwyn, Mr. Dharamsi Mulraj Khatau (Representing the Bombay Millowners' Association.)

Mr. Kasturbhai Lalbhai, Seth Chamanlal G. Parekh (Representing the Ahmedabad Millowners' Association.)

Mr. R. G. Saraiya, Mr. Jamnadas Ramdas, (Representing the East India Cotton Association, Ltd.)

Seth Isserdas Varindmal, (Representing the Karachi Cotton Association, Ltd.)

RESEARCH STUDENTS SELECTION SUB-COMMITTEE.

The President.
The Vice-President.
Dr. W. Burns.
Mr. H. R. Stewart.
Mr. J. H. Ritchie.
Mr. R. G. Allan.
Mr. P. B. Richards.
Rao Bahadur D. Ananda Rao Garu.
Mr. W. J. Jenkins.
Mr. J. C. McDougall.
Mr. H. H. Pandya.
Mr. Nizam-ud Din Hyder.
Dr. Nazir Ahmad.
Dr. V. K. Badami.
Vacant (two seats.)

COTTON FORECAST IMPROVEMENT SUB-COMMITTEE.

The President.
The Director-General of Commercial Intelligence and Statistics, Calcutta.
The Director of Agriculture, Bombay Presidency.
Do. do. Punjab.
Do. do. Madras.
Do. do. United Provinces.
Do. do. Central Provinces.
The Chief Agricultural Officer in Sind.
The Director of Land Records, Central Provinces and Berar.
The Commissioner of Agriculture, Baroda.
The Director of Statistics, H.E.H. the Nizam's Government.
The Director of Agriculture, H.E.H. the Nizam's Government.
The Deputy Director of Statistics, Calcutta.
The Agricultural Expert to the Imperial Council of Agricultural Research.
Mr. J. Vonesch.
The Statistical Officer, Board of Revenue, Madras.

SPECIAL SUB-COMMITTEE ON WIDER MARKETS FOR INDIAN COTTON.

The President.
The Vice-President.
Mr. H. R. Stewart.
Mr. J. H. Ritchie.
Dr. W. Burns.
Mr. S. D. Saklatvala.
Mr. J. Venesch.
Mr. Chunilal B. Mehta.
Mr. Y. G. Deshpande.
Mr. W. Roberts.
Mr. J. C. McDougall.
Khan Bahadur Sardar Habibullah.
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Rao Bahadur D. Ananda Rao Garu.
Mr. Nizam-ud Din Hyder.
Mr. W. J. Jenkins.
Mr. Kasturbhai Lalbhai, Seth Isserdas Varindmal, Mr. R. G. Saraiya, (*Co-opted.*)
Vacant (one seat.)

STANDARDS SUB-COMMITTEE.

Mr. W. Roberts (Representing the Imperial Council of Agricultural Research.)

Mr. Haridas Madhavdas, Mr. Varjivandas Motilal (Representing the East India Cotton Association, Ltd.)

Mr. A. P. Darlow, Mr. Kisharam Lekhraj (Representing the Karachi Cotton Association, Ltd.)

Mr. N. M. Deshmukh, Rao Bahadur G. R. Kothare, (Representatives of cotton growers of Berar Tract.)

Mr. Himatlal Jagjiwandas Vadodaria, Mr. Vadilal Chunilal Doshi, (Representatives of cotton growers of Mathia Tract.)

Mr. Akhubava Takhatsinghji Chudasama, Rao Saheb Kevalbhai Desaibhai Desai, (Representatives of cotton growers of Dhollera Tract.)

Mr. Haribhai Jhaveribhai Amin, Mr. Ardeshar Jamshedji Kapadia, (Representatives of cotton growers of Broach Tract.)

Sardar C. B. Naik Bahadur Desai, Rao Bahadur B. L. Patil (Representatives of cotton growers of Kumpta Tract.)

APPENDIX III.

LIST OF RESOLUTIONS.

" The Indian Central Cotton Committee notes with great satisfaction the Knighthood conferred on the acting President and tenders its cordial congratulations to Sir Bryce Burt on the high honour conferred on him."

" This Committee desires to record its appreciation of the excellent work of the Lancashire Indian Cotton Committee. The large increase in the takings of Indian cotton in the last three years is a striking testimony to the efficiency of their organisation and propaganda."

" That the Indian Central Cotton Committee notes with satisfaction the expeditious manner in which the Bombay Cotton Control Act was passed by the Legislative Council. It is confident that this piece of legislation will go a long way towards improving the quality of cotton of the Surat tract where *Goghari* has been spreading to an alarming extent and that the benefits to the grower expected from the Act will soon be realised."

" That the recommendation of the Standing Finance Sub-Committee that the Government of India be requested to make permanent the present fees for the fumigation of American cotton of Rs. 2-7-0 per square bale and of Re. 1-8-0 per round bale be approved."

" This Committee desires to request the President to bring to the notice of the Government of India the great necessity of their devising necessary means without delay to ensure that Indian cotton is not cut out from foreign countries owing to changed financial and other economic conditions in such countries."

" The Indian Central Cotton Committee congratulates the Bombay Government for the rapid progress they have made with the introduction of the Bombay Cotton Ginning and Pressing Factories (Amendment) Bill in the Bombay Legislative Council."

" The Indian Central Cotton Committee endorses the recommendation of the Local Sub-Committee regarding the detailed provisions in the Central Provinces Cotton Ginning and Pressing Factories (Amendment) Bill for dealing with watering, excessive seed, introduction of extraneous matter and mixing of different kinds of cotton."

" The Committee resolves that the complaint from Dhulia be reported to the Government of Bombay for effective prevention of this sort of malpractices reported by means of the Bombay Cotton Ginning and Pressing Factories (Amendment) Act."

" The Indian Central Cotton Committee desires to express its very great regret at the sudden and tragic death of Dr. F. J. F. Shaw, and wishes to convey its most sincere sympathy to Mrs. Shaw and her family in their great loss."

" The Indian Central Cotton Committee places on record its satisfaction that the Governments of Bombay and the Central Provinces have passed legislation for the control of cotton ginning and pressing factories. The Committee has no doubt that this measure will go a far way in suppressing the malpractices which are detrimental to the interests of the cotton grower as they mar the fair name of Indian cotton both in India and abroad and it now desires strongly to impress upon the Governments concerned the desirability of bringing the Act into operation at the earliest possible date in those tracts where its application is indicated. The Committee further hopes that it will be given an opportunity of commenting on the rules to be framed by Local Governments before they receive legislative sanction."

" The Indian Central Cotton Committee urges on the Government of Sind the necessity of taking very early steps to make the Cotton Ginning and Pressing Factories (Bombay Amendment) Act effective in that province by framing rules as early as possible before malpractices become established in the newly developed cotton tracts of that province."

" That the Indian Central Cotton Committee notes with satisfaction the continued efforts of the Lancashire Indian Cotton Committee to extend the use of Indian cotton in Lancashire and trusts that the good work being done by that body will be of mutual advantage to both countries.

While appreciating the efforts made by the Lancashire Indian Cotton Committee to increase the use of Indian cotton and whilst expressing satisfaction that the figure of nearly 5 lakh bales has been reached the Indian Central Cotton Committee desires to point out that from statistics of counts of yarns of 20 and below produced in the United Kingdom the Committee believes that there is still much further scope for use of Indian cotton in the United Kingdom."

" The Indian Central Cotton Committee welcomes the action of the United Provinces Government in submitting the United Provinces Cotton Pest Control Act of 1936 to the United Provinces Legislative Council, and records its approval of the Bill.

The Indian Central Cotton Committee records its opinion that the proposed legislation is in the interests of the cotton growers and the cotton trade of the United Provinces, and that effect should be given thereto as early as possible."

" This Committee is of opinion that it is necessary to extend the Cotton Ginning and Pressing Factories (Bombay Amendment) Act to the districts of East and West Khandesh and other tracts particularly in view of the fact that the Central Provinces Government has only recently passed a similar Act.

The Committee also desires to draw the attention of the Government of Bombay that the Bombay Act as at present worded cannot prevent the mixing of cotton waste with cotton and, therefore, requests the Government of Bombay to take in hand the necessary amendment so as to prevent the mixing of cotton waste with cotton.

The Committee also requests the Local Sub-Committee to report as to other areas in the Bombay Presidency to which it would be desirable to apply the Act."

APPENDIX IV.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Annual Report for the Year ending June 30th, 1936.

The Institute of Plant Industry is a Society registered under the Holkar State Societies Registration Act and its primary objects are :—

(*a*) The investigation of all matters relating to the production and improvement of raw cotton in India.

(*b*) The agricultural development of the Indian States which are members of the Society.

(*c*) The training of officers and cultivators nominated by such States.

(*d*) The training of advanced students nominated by the Indian Central Cotton Committee.

Its funds are derived entirely from subscriptions. In the financial year 1935-36 the Indian Central Cotton Committee made a grant of Rs. 97,600 and the member-States in Central India and Rajputana subscribed Rs. 67,335.

The Institute is subsidised by the Indian Central Cotton Committee primarily in order that it may act as a central research station for the elucidation of botanical and agronomic problems of cotton of too wide a nature to be attacked by *ad hoc* schemes. The Indian Central Cotton Committee has also a secondary interest in the Institute in its work for the improvement of variety and cultivation conditions of cotton in Central India and Rajputana.

The interests of the member-States lie in the investigation of the specific crop problems of their own territory, and in the development and dissemination of better seeds and more efficient agricultural practices.

The interests of the Indian Central Cotton Committee and of the member-States are complementary, and provide a very satisfactory balance to the work of the Institute.

The Governing Body of the Institute is representative of the Cotton Committee and the member-States, and its President is the Agent to the Governor-General in Central India, *ex-officio*. The Director of the Institute is also Agricultural Adviser to States in Central India and Rajputana, and in addition represents all those States upon the Indian Central Cotton Committee.

Administrative and General.

1. *General and Board of Governors' Meetings.*—The fourth General Meeting of Members of the Society was held on January 31st, 1936, when discussion took place on the question of amending the constitution to admit of membership of the Institute by bodies other than States and the Indian Central Cotton Committee. It was decided not to make such amendment for the present. At the close of the meeting the States' representatives present elected the States of Barwani, Jaipur, Dhar and Jodhpur, each to provide a Governor for the ensuing three years.

The Board of Governors at its 16th Meeting held on the following day decided that on purely financial grounds they could not invite Mr. F. K. Jackson, the Director of the Institute, to accept an extension of his contract which expired in July. The Board recorded by resolution their appreciation of Mr. Jackson's "devoted and able services to the Institute and its sincere regret at the impossibility of affording their continuance."

The report for the year ending June 30th, 1935, and the programme for the current year were approved, subject to any contraction in the programme made necessary by the Board's later decision that Budget provision for staff salaries in the ensuing financial year should be reduced by Rs. 8,000. Thus the serious financial situation mentioned in the last report has become much more acute, and valuable specially trained staff have already been lost either by dismissal or resignation in anticipation thereof.

2. *Contributing Members of the Institute.*—It is satisfactory to record the accession as Members of Chhatarpur and Karauli States, and the Sikar Illaqa of Jaipur State. The Ajmer Merwara District Board (which is at present precluded from membership by the terms of the constitution) is now contributing to the Institute, which has also received handsome donations (Rs. 2,000) from the Nuwara Eliya Tea Estate Co., Ltd., for advisory services rendered, resulting in the successful adaptation of the Indore compost process to Ceylon conditions. That a commercial firm should make such voluntary payments is clear proof of the value of this process and of the Institute's co-operation.

At the closing date of this report the following twenty-five States and Thikanas were members of the Institute, arranged in order of joining :—

Indore	Tonk	Orchha
Dhar	Bijawar	Jodhpur
Jaora	Barwani	Alwar
Datia	Bikaner	Khetri
Rutlam	Rewa	Bagli
Dewas (Senior Branch)	Jaipur	Jhabua
Sitamau	Bundi	Chhatarpur
Narsingarh	Partabgarh	Sikar and Karauli

Bharatpur State, under minority administration and with a heavy burden of debt, has been contributing at a specially reduced rate (about one-third of the normal) for an agreed period of five years. The administration, finding itself unable to pay at the standard rate, fixed by the Board of Governors, has withdrawn from membership.

Negotiations are in progress with a number of important States who desire to avail themselves of the manifold advantages of membership. In view of numerous suggestions that these advantages should be made available at a reduced rate it is perhaps desirable to draw attention to the extremely reasonable rate at present laid down. The contribution for State's membership of the Institute decided on by the Board of Governors and agreed to by the State's representatives thereon is Rs. 100 per lakh of total revenue—a very small sum in relation to the paramount importance of agriculture to practically every State in India, and to the value of the Institute's assistance to any State wishing to enhance its revenue by increasing the income of its *ryots*, who themselves usually provide nearly all that revenue.

By way of illustration it is worthy of note that the Punjab, Madras and the United and Central Provinces expend from one-twenty-fifth to one-fortieth of their total revenue upon their Agricultural Departments. It is hardly to be expected, therefore, that an enlightened State administration should grudge one-thousandth of its revenue for the support of a central institution which has already done so much to provide new sources of wealth for States and their populations. It is a regrettable fact, however, that in few Indian States, whether small or large, does the development of their greatest industry receive the attention and support it deserves.

Those who are familiar with its record of discovery and application of solutions to the agricultural problems of its member-States will testify that the Institute has fully justified its existence. Its members in the past have profited much from the heavy capital outlay and the share of overhead expenses borne by the Indian Central Cotton Committee. It seems probable that circumstances will force that body to reduce its grants still further in the near future and therefore if serious reductions in the Institute's efficiency are to be avoided a much larger measure of financial support must be given by States.

3. *Staff and Students.*—The Geneticist and Botanist was absent on leave and deputation in Europe from 13th July to 6th October 1935, when he led the Government of India delegation to the Imperial Botanical Conference in August and was a member of the delegation to the Sixth International Botanical Congress in Amsterdam in September.

As a result of this absence and of a temporary reduction in staff in the Genetics and Botany Section for two months during the busiest season of the year, the preparation of papers for publication has not been as rapid as it would otherwise have been.

Consequent on the retrenchment prescribed by the Board of Governors the Extension Officer (Mr. M. L. Saksena, L.Ag.), who was on five years' deputation from the Department of Agriculture, United Provinces, returned to his parent service a year before the expiry of his deputation and Mr. Kubersingh, B.Ag., for many years Plant Breeding Assistant, was appointed to the post, and was replaced by Mr. C. P. Dutt, M.Sc. (Calif.).

Two posts of Junior Farm Assistant were abolished, and two of Research Assistant in the Chemistry and Agronomy Section remain vacant for lack of funds, in addition to others.

The uncertainty as to their future which unfortunately prevails in the minds of a number of the research workers in the Institute is not conducive to that steady application and calm atmosphere so essential for good work on intricate problems. What has been done by these workers is therefore all the more creditable.

The personnel of all Sections have worked with a vigour and enthusiasm which is most praiseworthy and which is due, in no small measure, to their realization of, and pride in the fact that they are building up an organization which in many ways is unique in India, and which is commanding in an increasing degree the respect and attention of those of much older standing.

That numerous requests are received from highly qualified scientific workers both in India and abroad, to be allowed facilities at the Institute to carry out research work on a voluntary basis is a proof of the Institute's rising reputation. Most of these requests had to be refused, owing to limitations in accommodation and equipment but five such workers have been entertained during the year.

4. *Visitors.*—The Institute received the honour of visits by His Highness the Maharaja Scindia of Gwalior, who devoted several hours to a thorough examination of the work in progress, and Their Highnesses the Maharajah of Dewas (J.B.) and the Raja of Sailana.

On the occasion of the twenty-fifth Session of the Indian Science Congress, held in Indore in January 1936, a special half-day excursion was arranged when more than 300 members and others visited the Institute. Special displays were made, illustrating all the Institute's activities, which were first explained in general terms by the Director and Heads of Sections, the guests afterwards visiting the laboratories, the farm and the Residency Area municipal refuse disposal ground where the Institute's compost process is used.

Among other visitors during the year were the following :—

Aslam Beg, Mir, Revenue Secretary, Jaora, Central India.
Avasia, Motilal H., Dewan, Sitamau, Central India.
Bakhliwal, G. M., Engineer, Cotton Factories, Udaipur, Rajputana.
Banerji, N., Home Minister, Banswara, Rajputana.
Bapna, K. M., Assistant Commissioner of Excise, Commerce and Industry, Indore.
Benger, U. R., Engineer, Sajjan Mills, Rutlam.
Bingley, B. R., Registrar, Co-operative Societies, Holkar State.
Brahmachari, U., Kt., Rai Bahadur, M.A., M.D., Ph.D., Calcutta.

Burt. B. C., Kt., *Vice-Chairman*, Imperial Council of Agricultural Research, New Delhi.
Caton, A. R., Indian Village Welfare Association, 4, Great Smith Street, London.
Dastur, R. H., Cotton Physiologist, Agricultural College, Lyallpur.
Dhanda, H. C., General Manager, Indore Electric Supply, Indore.
Dhar, N. R., Professor of Chemistry, Allahabad University.
Dungray, K. B., Senior Member, Court of Wards, Gwalior Government.
Engledow, F. L., Professor of Agriculture, Cambridge University.
Fitze, K. S., the Hon'ble Agent to the Governor-General in Central India, Indore.
Gaurihar, Jagirdar of Bundelkhand, Central India.
Gosalia, H. N., Dewan Bahadur, Dewan and President, Council of Administration, Barwani.
Hiralal K. Seth, Rai Bahadur, Rajya Bhushan, Managing Director, Rajkumar Mills, Ltd., Indore.
Hulkoti, R. Y., Acting Professor of Agriculture, Poona, with a party of 53 students.
Jasol, Kunwar Amar Singh of, Director of Agriculture and Grass Farms, Jodhpur, Rajputana.
Kanungo, S. V., Finance Minister, Holkar State, Indore.
Kesarisingh, Chief Member of Council, Kishangarh, Rajputana.
Kibe, M. V., Sardar, Indore.
Kripa Narain, Agricultural Officer, Udaipur, Rajputana.
Lalsingh, N., Revenue Officer, Sitamau, Central India.
Malaviya, Pt. Madan Mohan, Vice-Chancellor, Benares Hindu University.
Mehta, Chunilal V., Kt., Ex-Executive Councillor to the Bombay Government.
Mill, A. N. R., Lt.-Col., R.A.M.C., Mhow.
Misra, Champa Ram, Rai Bahadur, Dewan, Chhatarpur State, Central India.
Moonje, B. S., Dr., Nagpur, Central Provinces.
Mulk Raj, Chief Revenue Officer, Dhar State, Central India.
Mulye, N. B., Education Member, Gwalior State.
Murray, Kenneth G., San Francisco, U.S.A.
Nadkar, K., Dewan Bahadur, Dewan and President, Council of Administration, Dhar, Central India.
Nadkarni, M. M., Manager, Sajjan Mills, Rutlam.
Nurullah, Mian, M.L.C., Lyallpur.
Niranjan Swaroop, Hawale Superintendent, Jodhpur, Rajputana.
Palairet, C. R., Consulting Engineer, Bombay.
Patwardhan, K. A., Assistant Master, Daly College, Indore, with parties of Kumars.
Phatarpekar, V. S., Kamdar, Bagli Estate, Central India.
Pratap Narain, Kamdar of Gaurihar, Bundelkhand, Central India.
Purshottamdas Thakurdas, Kt., Vice-President, Indian Central Cotton Committee.
Rama Reddi, P. H., Secretary, Indian Central Cotton Committee.
Rangaswami, G. N., Millets Specialist, Research Institute, Coimbatore.
Rustamji, General Manager, Cotton Factories, Udaipur, Rajputana.
Sethi, M. C., Professor of Botany, Forman Christian College, Lahore.
Shaw, F. J. F., Acting Agricultural Expert, Imperial Council of Agricultural Research, New Delhi.
Seth Girdhar Lal, Rajkumar Mills, Ltd., Indore.
Sinha, M. Thakur, Revenue Member, Bundi, Rajputana.
Sitole, G. R., Jagirdar, Gwalior State.
Sur Sinhji, K. S., Director of Agriculture, Nawanagar State.
Tambe, S. L., Rao Sahib, Commissioner, Malwa Division, Holkar State.
Tambey, G. R., Ex-Dewan of Bagli, Indore.
Taylor, J. T., Dr., United Church of Canada Mission, Indore.
Tongra, Gulab Chand, Seth, Indore.
Tsolakidis, P. T., Agent, Messrs. Ralli Brothers, Indore.
Udawat, G. P., Superintendent, Model Farm, Beawar, Ajmere.
Uttam Narain, Pandit, Rai Bahadur, Dewan of Sailana, Central India.
Vonesch, J., C/o. Messrs. Volkart Brothers, Bombay.
Wade, E. W., Lt.-Col., R.A.M.C., D.A.D., M.S. (Hygiene), Poona.
Walchand Hirachand, Director, Kalamb Sugar Works, Baramati, Poona.

West, W. D., Geological Survey of India, Calcutta.
Wilkie, D. C., the Rev. and Mrs., Beawar, Ajmere.
Yegna Narayan Aiyer, A.K., M.A., Dip. Agri. (Cantab), Retd. Director of Agriculture, Bangalore.
Yelwande, R. C., Revenue Minister, Dewas (J. B.).

5. *Library.*—Accessions during the year were :—

Text-books and works of reference	41
Complete volumes of journals	140
Reports, bulletins, etc.	247

Eight new journals have been added to the list of periodicals taken in the Library. Loans of 165 books and journals were made to cotton research workers in India and agricultural officers of member-States. Exchange of publications was kept up with the Provincial Agricultural Departments of India and many foreign institutions. A book-catalogue of the pamphlets, which occupy a very large space in the Library, has been prepared according to authors, in addition to the author and subject card-catalogues. The classification of books and pamphlets on the Universal Decimal System has been completed. The binding of loose sets of journals is up-to-date. Books and bulletins numbering 788 have been sold, to the value of Rs. 480.

Research Work.

6. *Organization.*—During the last few years an increasingly high standard of research work has been aimed at and attained. This will be seen in the ensuing pages, as well as in previous Reports, which describe a great deal of new work, much of it conceived on original lines, and nearly all with an immediate and clear practical end in view, which in many cases has already been achieved.

This has been done in spite of the fact that the head of the Genetics and Botany Section could not be recruited until the end of August 1933, and of the financial uncertainty in the last two years, which has led to the loss of research staff on whose special training much time and care had been spent.

The revision in research policy introduced in 1932 has borne fruit abundantly. The research staff take great pains to keep abreast of the results of other workers in their subjects, and for this the abstract publications of the Imperial Agricultural Bureaux have been invaluable.

The fullest use is made of modern methods of experimentation and particular mention may be made of the applications of mathematics to the design of field and laboratory experiments, and to the statistical treatment of their results, which probably have been more thoroughly and extensively exploited at the Institute than by any other research organization in India. The statement below shows the extent to which, in field experiments alone, such methods have ben utilized.

Randomized, replicated field Experiments.

———	1932	1933	1934	1935	1936 (*kharif*)
At Indore	24	82	43	35	56
In States	33	87	142	178	95

The precision and rapidity with which results can be interpreted amply repay the extra trouble involved.

Statistical methods have also been applied with outstanding success, to plant breeding problems, and the new technique evolved enables degrees of superiority or inferiority to be recognised with accuracy several years sooner than has hitherto been possible. In the laboratory, too, the degree of accuracy of measurements and analyses can also be determined by similar methods, which are in regular use at Indore, though not commonly elsewhere.

The willing co-operation of the States and their officers in carrying out field trials sponsored by the Institute remains a feature worthy of much commendation. Owing to this, many items are now ripe for propaganda by them.

The Institute is once again indebted to the Provincial Departments of Agriculture in India for many courtesies and much assistance, and it is pleasing to be able to record that repayment in kind becomes increasingly possible. These remarks also apply to Agricultural Departments in the U. S. A., the French Colonies, Russia, Iran, and many parts of the Empire.

7. *Weather and its effects on Crops.*—In Malwa the monsoon rainfall was close to the average of many years, the Institute recording 30.8 inches from June to September. July was the wettest month with 12.76 inches and in some parts recently sown cotton and other *kharif* crops were injured by heavy down-pours. On the whole, however, the season was good, and yields were much higher than in any year since 1930. The following table shows the contrast with the years 1933 and 1934, and illustrates the vagaries of the Malwa monsoon.

	1935	1934	1933
Pre-monsoon	1.67	0.10	0.60
June	5.97	10.72	10.09
July	12.76	8.08	14.75
August	4.83	21.17	14.44
September	7.24	15.96	10.35
October	1.52	..	0.91
November	0.34	1.40	0.19
Total ..	34.33	57.43	51.33

In the Nimar tract rainfall was light and ceased early, which affected the *rabi* crops. In parts of Bundelkhand heavy and continuous rains in the early monsoon seriously damaged crops. Most parts of Rajputana had rather more than a normal rainfall and good crops but Jodhpur was rather short and Bundi in excess.

There was no frost in Central India save in the northern States bordering Rajputana, where also there was no very severe damage to crops.

8. *Cotton—Botany and Genetics.—(a) Classification of Gossypium.*—Advantage was taken of the deputation of the Geneticist and Botanist to England to study the types of *Gossypium* in the Linnean Herbarium, and the collections of indigenous African cottons at Kew. The study of the Linnean types revealed considerable confusion in nomenclature, while the absence from the Kew collections of material from French Africa left certain obscurities in the relationships of the wild and cultivated African types. As it is of great importance that the classification, when published, shall be both complete and in a form acceptable to taxonomists as well as to cotton workers, it was considered desirable to clarify these two points before proceeding further. The status of the African cottons has been elucidated in correspondence with Prof. Aug. Chevalier, in Paris and a suggested

solution of the confusion in nomenclature has been referred to a systematic botanist for his opinion. It is hoped that it will be possible to publish in the course of two or three months.

(*b*) *Botanical Survey.*—The writing up of the survey of the cottons of Malwa and Nimar is almost complete. During the year the survey work of the section has been greatly extended. In connection with the Bengals Improvement Scheme*, a study was made of the indigenous cottons of Rajputana. Data of scientific interest have been included in the report of the survey of the cottons of Malwa and Nimar. The plant breeding material collected, which is of great promise, has been included in the current year's experimental programme at Sriganganagar and at Indore. At the request of the Indian Central Cotton Committee, a preliminary study was undertaken of the indigenous and introduced cottons of Kathiawar, in order to determine the most profitable lines of attack on the problem of the improvement of the quality of Dholleras cotton. Extensive tours were undertaken at the times of harvest of the two types of cotton now under cultivation, Matheo and Wagad. The present status and botanical composition of the two crops was elucidated, and selections were made in both. It was established that: (1) The range of variation in Wagad is very much greater than in Matheo. This was predicted from the history of the two types. (2) If a *herbaceum* cotton is ever to be re-established in the present Matheo tract, it will have to be an early type bred by crossing Wagad with an early *herbaceum*, probably from Iran or Afghanistan. In this connection it may be observed that the elucidation of the status of the indigenous cottons of Africa has revealed the fact that *G. herbaceum* types morphologically similar to those grown in Kathiawar are very widely distributed in the French Sudan and neighbouring areas. The possibility of obtaining thence types of value either directly, or as parents for crossing, will have to be borne in mind when the improvement of the *herbaceum* cottons of India is under consideration. (3) The possibility of improvement of the early, hardy Matheo, though small on account of its low variability, is by no means negligible, but the finer types found in it were usually later than the coarse, typical forms. This may be taken to indicate the influence by hybridisation of primitive *G. arboreum* types such as Rozi.

At its meeting held in January 1936, the Indian Central Cotton Committee voted money for the travelling expenses of a Botanist for a three months' tour in Iran to collect promising early types of *herbaceum* cotton. The Institute agreed to provide the Botanist and to pay his salary. Arrangements are in progress for the Second Plant Breeding Assistant to proceed to Iran in September next.

Investigations into the possibilities of substituting medium for short staple *desi* varieties of cotton have yielded valuable results. The study of old literature has shown that *desi* cottons which would now be classed as medium or long staple were formerly grown in the Nerbudda valley and in parts of Rajputana, two areas which are now contributing largely to the embarrassing bulk of India's short-staple crop. The invasion of short-staple cotton in these two areas is quite clearly the result of the stimulus of the demand for high ginning types by the owners of power gins at a time when the mill industry was not in a position to pay an adequate premium for quality. A similar invasion of short staple cotton has occurred more recently in Kathiawar as a result of economic pressure for an early cash crop. Tours in all three areas have demonstrated beyond doubt that the old finer types exist in small quantities in the mixed crops at present grown, and only await isolation, and the stimulus of an adequate premium for improved quality, to regain their former position. Taxonomic studies have shown that this wave of short staple cotton which has submerged the cotton growing areas of North Western, Western and Central India is of the geographical race of *G. arboreum* var. *neglectum* which originated in the Eastern Bengal-Assam cotton tracts. Only Malwa has escaped, and for the reason that the short stapled types are late in Malwa and do not give their crop before the incidence of frost. Malwa, however, has succumbed to another invader, a more or less naturalised form of *G. hirsutum* (an American Upland mixture, locally known as Cambodia) which imparts a certain softness to the mixed lint, but is (in pure culture) a

* Financed by the Indian Central Cotton Committee, for the study at Sriganganagar (North Bikaner) of *neglectum* cottons of possible utility for the improvement of the coarse cottons of the Bengals tract.

low-yielding type, and is very ill-adapted to the predominantly *barani** cultivation of the tract. Its survival is probably very considerably assisted by the favour with which it is regarded by mills and ginneries.

(*c*) *Genetics.*—(*i*) Further confirmation of Hutchinson's theory of the organization of the gene has been provided by the discovery of at least one more allelomorph in the leaf-shape series.

(*ii*) Studies on the fundamental genetic basis of the lint hairs are being carried on, and either four or five genes for "lintless" are now known.

(*iii*) Investigations on the problem of the interaction of genotype and environment have been facilitated by the discovery of the new Upland "crinkled." When grown under conditions of low humidity in a greenhouse in the hot weather, the Upland "crinkled" develops perfectly normally, while the Egyptian "wrinkled leaf" develops the crinkled leaf typical of the genotype. Under all other conditions, both Upland "crinkled" and Egyptian "wrinkled leaf" develop typical crinkling. The F1 between them behaves like the Upland parent, growing normally in the greenhouse in the hot weather and becoming crinkled when the humidity rises in June. Fully developed leaves do not change their character with changing environment, so crinkling must be the result of abnormal growth. The main morphological cause of crinkling appears to be that growth at right angles to the main veins does not keep pace with growth in length. Since growth in length is radial from the leaf base, this results in curling of the leaf as a whole, as well as puckering of lamina between veinlets.

(*iv*) The work of interspecific hybridization with *G. anomalum* recorded under "Cytology" in the last report has developed chiefly on the genetic side. The second back-crosses were very successful, combining great vigour, and a desirable plant habit, with lint of reasonable length and fineness and a fair ginning percentage. Considering the facts that (1) the F1 was highly sterile, (2) the *G. anomalum* parent had no spinnable lint, and (3) the Asiatic type used in the first cross was of very inferior quality, the results considerably exceeded expectation. The behaviour of selfed progenies of the best plants in the current season should provide much-needed information on the number of back-crosses required in an inter-specific cross to re-establish genetic balance. The work is handicapped in some directions by the difficulty of germinating seed of the F1's and by the failure to grow *G. anomalum* at Indore.

(*v*) From the study of genetic variance in parents, F1's and F2's of all possible crosses between three strains of *G. arboreum* var. *neglectum* data of great interest are now available. The preliminary stages of the analysis have demonstrated the existence of hybrid vigour even in intervarietal crosses, and the existence of genetic variance in strains which have been selfed for as much as seven generations. The replicated progeny-row technique developed last year has made possible the elimination of a number of disturbing factors which would have vitiated the experiment if laid out on any of the systems in common use for such purposes.

(*d*) *Selection, Breeding and Seed Distribution—Malwa Tract.*—Plant breeding work has been closely linked with the study of genetic variance referred to above. The principle of basing selection on variance as well as mean value has proved its worth, and the advantage of the replicated progeny-row technique over current plant breeding methods becomes greater as time goes on. Abundant information is now available for compiling papers on the replicated progeny-row technique, and on the results so far achieved from it.

(*i*) The first achievement of the new technique has been the isolation of five sub-strains from Malvi 9 which differ considerably in their morphological characters. Two of the sub-strains surpass both Malvi 1 and Malvi 9, considerably in earliness. Spinning

* Unirrigated and unmanured.

tests on them and on Malvi 9 bulk show marked differences between them. They were valued as fit for the following highest standard warp counts:

Strain	H. S. W. C.
M9-bulk	16's
M9-13	20's
M9-15	15's
M9-17	22's
M9-19	13's
M9-20	21's

The isolation of sub-strains up to 37 per cent. better in spinning value, from a strain which, according to any current plant breeding standard would have been considered pure, must be regarded as a considerable achievement. The three sub-strains, M9-17, M9-19 and M9-20, sprang from sister plants in the 1932-33 crop and the isolation of sister plants whose progenies differed by as much as 70 per cent. in spinning value is a remarkable demonstration of the potentialities of improvement in spinning value, if methods of estimating it can be found which will meet the demands of the plant breeder.

(*ii*) A mill test on a full bale of Malvi 9 bulk was arranged by the Director of the Technological Laboratory, Matunga, and carried out by the Bombay Dyeing and Manufacturing Co., Ltd. In nominal 20's counts it gave a test of 63 lbs., and the cotton was valued at Rs. 40 on Broach.

Trade opinion is unanimous that Malvi 9 represents a great advance in quality over the Malvi crop at present grown. Technological Laboratory tests show that its spinning value is about 50 per cent. better than the local mixture grown on the same land, at Indore, and about 100 per cent. better than the local *desi* component of the mixture, grown under the same conditions. Every effort is being made to organize its multiplication in solid blocks in order that the trade may be in a position to obtain pure lots of it at the earliest possible moment, and therefore to pay a proper premium for its quality. Nevertheless, experience with Malwa Upland has led to the conclusion that even with very large improvements in quality the maximum premium obtainable is about 15 per cent. and the main emphasis therefore remains on increased yield rather than on increased quality.

(*iii*) The demand for seed of Malvi 9 has been so great that it has not been possible to meet even some of the more important indents. Eighty-one maunds of seed of Malvi 9 and 155 maunds of seed of other Malvi strains have been distributed for the current season. With a view, primarily, to study the difficulties and costs involved in a cotton seed distribution project, and secondly to provide a seed supply more nearly adequate to the demand, five villages in the vicinity of the Institute have been provided with Malvi 9 seed for their best lands and Malvi 1 seed for the whole of the rest of their cotton area. It is intended next season to fill up the whole cotton area in these villages with Malvi 9 from seed from their Malvi 9 crops of this year and thereafter to use them as a nucleus block for seed supply on a larger scale than is at present possible.

(*iv*) The examination of the new Malvi selections has shown that few of them attain the lint quality of Malvi 9, but most of them are somewhat superior to Malvi 9 in wilt resistance. In view of the likelihood that their genetic variance will be greater than that of Malvi 9, the best of them have been retained for further test, and intensive selection. The demonstration of differences between M9-17 progenies in wilt resistance has also led to selection for it within Malvi 9. The comparison of the rates of improvement under selection in strains fresh from the field and strains line bred for nine generations is expected to provide interesting and valuable information.

(*v*) The Dhar mass-selected Malvi strain and the first seven progenies selected from it have already been tested against Malvi 9 in a full size experiment. Yield was as high as Malvi 9, but staple length and ginning per cent. were somewhat lower. This first batch has, therefore, been discarded in favour of the next batch coming for test, some of which have considerably better lint properties. Among them, also, are strains with greater monopodial development than is usual in Malvi cotton. On theoretical grounds it is considered that such a habit may be of value in delaying flowering until after the risk of

late rains, and then getting flowering over in a sufficiently short period to ensure the ripening of the crop before the danger of damage from frost. The prediction will be checked by flowering and cropping records in the current season.

The Dhar Malvi material will be grown in parallel cultures at Indore and Dhar in the current season, and comparison will be made between the genetic variances of new selections from the field, mass-selected material from Dhar and line-selected Malvi 9. The fundamental importance to plant breeders of information concerning the effect of selection on genetic variance is obvious.

(*vi*) The transfer of work on Malwa Upland (American) to Badnawar (Dhar State), referred to in last year's report has already resulted in substantial progress. A strain giving considerably higher yield than the bulk has been isolated, and further promising early strains and high quality types are being tested in the current season.

(*vii*) From the Nimar selections the first batch has now been taken for full scale test. The good quality types are all of the "yellow-flowered, broad-leaf" constitution which has a much higher survival value than Verum types in the Central India section of the Nerbudda valley. One Roseum type has been retained on account of its wilt resistance. A number of selections are now available with satisfactory staple length and "feel." Ginning percentage, however, is usually not more than 30. As studies of the effect of selection on commercially valuable characters in cotton have shown that ginning percentage responds more rapidly to selection than any other character, and as correlation studies in the Nimar material show that considerable improvement has already been effected, there is every reason to believe that a satisfactory value can be attained without going outside the material now in hand.

(*viii*) The out-station cotton breeding work at Dhar, and Badnawar, and in Nimar is carried out at three separate centres each about 50 miles from Indore with the co-operation of the Superintendent of Agriculture and two Agricultural Overseers of Dhar State, and of a progressive ginowner. The improvement achieved in two seasons is a convincing demonstration of the practicability of conducting plant breeding work on modern lines at district centres where only limited assistance is available, and laboratory facilities do not exist.

(*e*) *Variety Trials.*—Cawnpore 520 and Mollisoni were compared in randomised block trials in 1935 at the State Farm at Sriganganagar and in cultivators' fields both in the light soil and on the stronger Ghaggar bed soils at six centres in the Gang Canal Colony (Bikaner State). Yields were poor. Cawnpore 520 did not differ significantly from Mollisoni except in the light soil where the latter yielded significantly better. Cawnpore 520 obtained a premium of about eight annas per maund of *kapas* over Mollisoni at all centres. At the State Farm eight *desi* strains from Lyallpur were compared with Cawnpore 520 and Mollisoni. All these strains are of poor quality like Mollisoni and out of them only two, Roseum 10 and Mollisoni 74, have been retained for further trial on account of their good yield and high ginning percentage.

In Jaipur State trials were carried out at three centres. Due to late sowing yields were poor. Cawnpore 520 on the whole did better than the other varieties tried.

In the black soil area of Jodhpur State trials were conducted at three centres. This is the only tract so far studied where an Upland variety appears to be more profitable than *desi* types. On the basis of results obtained so far, a trial distribution of Indore 1, a selection from Malwa Upland, has been recommended.

The only trial in the black soil area of Bundi State suffered from late sowing and all varieties except Indore 1 gave a significantly lower yield than local.

The most important trials in Malwa were those carried out at four centres for comparison of Malvi 9, Dhar Cambodia and local on *adhan** land. It is now safe to conclude that Malvi 9 is as profitable as Upland cotton under conditions most favourable for the

* Irrigated and manured for many years.

latter, while Malvi 9 is more profitable under all other conditions. At Chhabra in Tonk State Malvi 9 yielded as well as the local cotton and had a better staple and a considerably better ginning percentage.

In Nimar replicated trials were carried out at Khargone, Sendhwa, Kannod and Kukshi while single plots were laid out at three centres in Barwani State. N. R. 5 was the best yielder and the best ginner among the varieties tested but is of a very poor quality and cannot be recommended. Verum 434 is a promising strain. It is of superior quality, yielded as well as the local and gave a slightly higher ginning outturn. Further trials with Verum 434, Banilla and Malvi 9 are necessary.

(*f*) *Physiology.*—(*i*) A botanical analysis of the published data on spinning quality and hair characters has been made and the findings are being put together for publication. Various possible methods of improving the efficiency of estimation of the small differences in spinning value of importance to the plant breeder have been explored, but so far without much success. The discrepancy between the hair properties and spinning values of Malvi 1 and Malvi 9 remains unaccounted for.

(*ii*) Arising out of the cotton census, physiological experiments were carried out in the hope of discovering the main factors responsible for the observed differences in survival value of the four simple geno-types. Monthly changes in leaf area and dry weight were determined and it was shown that while leaf shape affects very greatly the area of the individual leaf, the total leaf area per plant was the same in both leaf-shape classes. Broad-leaved, yellow-flowered, and narrow-leaved, white-flowered classes, however, had considerably and significantly greater leaf areas per plant than narrow-leaved, yellow-flowered and broad-leaved, white-flowered classes. The classes with the greater leaf area are those which were found to have the higher survival value. Differences in dry weight were suggestive but not conclusive. Further work is in progress.

(*iii*) Experiments on the effect of competition on the relative survival value of *desi* and American cottons in Malwa revealed the fact that their behaviour in pure culture is no guide to their behaviour in a mixed crop. Data have been collected on differences in germination, post-germination mortality, and cropping power under different conditions of competition, and the reasons for the survival of Upland in Malwa are becoming much clearer in consequence.

9. *Cotton—Physiology, Pathology and Agronomy.* (*a*) *Leaf-roll and Red-leaf of American Cottons.* (*i*) *Occurrence and influence on yield.*—This malady is the chief obstacle to successful growth of American cottons on the black cotton soils of Malwa. Better results are obtained on the open-textured and highly manured *adhan* soils of this tract and on the manured and irrigated soils of Rajputana. The disease, however, appears even there under certain conditions and affects yields. On the irrigated arid soils of the Gang Canal Colony the disease may appear during October while the crop is maturing, but does not seem to affect the yield, as indicated by the observations in the year 1934-35, given below.

TABLE 1.—*Yield Differences in Healthy and Diseased Plants*—1934-35.

Variety: P.289F; at Sriganganagar, Bikaner State. Mean yield of *kapas* (seed cotton) in grammes per plant from 30 random pairs.

CONDITION.	First picking.	Second picking.	Third picking.
Healthy	77.67	364.00	323.33
Diseased	411.33	209.67	97.67
	P.	Sig. differences.	
Health and disease	>0.05	..	
Pickings	<0.05	5.22	
Interaction: Health, disease x pickings	<0.01	6.63	

Total yield of *kapas* was not affected. Most of the yield of diseased plants was obtained in the first picking, falling in the proportion of 4:2:1 at each picking, while the yields of the second and third pickings of healthy plants were nearly five times that of the first picking. The first picking of diseased plants and the second picking of healthy ones yielded equally. This shows a premature ripening of the diseased plants due to a check in normal development—confirmed by the observed partial bursting of bolls. This may be the cause of reduced quality in a diseased crop with normal yield. A Cambodia crop affected by red-leaf on black soil at Dhar, Malwa, during 1934-35, gave a lint length of about 19 millimetres only.

(*ii*) *Chemical Differences in the Composition of Mature Leaves of the Healthy and Diseased Plants.*—The pH values of the water-extracted sap of the healthy, green Cambodia leaves were significantly higher than those of both the green and red portions of the diseased leaf. There was no difference between the sap of green and red portions of the same leaf.

TABLE 2.—*pH Values of the Sap of Healthy and Diseased Leaves of Cambodia Cotton at Indore.*

COMPARISON BETWEEN	Mean pH		n	t	P
	Healthy	Diseased			
1. Healthy green (whole leaves) and rolled green portions of leaves ..	5.82	5.69	12	2.34	<0.05
2. Healthy green (whole leaves) and red portions of leaves	5.82	5.61	12	3.53	<0.01
3. Green and red portions of rolled leaves	5.69	5.61	14	2.06	>0.05

The concentration of the sap—as indicated by osmotic pressure measurements—of healthy leaves was higher than that of unhealthy ones.

TABLE 3.—*Mean Osmotic Pressures (Atmospheres) of leaf-sap of Healthy and Diseased (leaf-roll) Cambodia cotton plants.*

Healthy	Diseased	n	t	P
6.7	5.2	120	6.87	<0.01

These observations indicated that the sap of diseased leaves was poorer in soluble matter—apparently in basic materials. This was borne out by actual analysis of samples of healthy and diseased mature leaves collected at Indore and Jaipur, boiled immediately and preserved in 90 per cent. alcohol. The outstanding differences in the composition are given below :—

TABLE 4.—*Composition of Healthy and Diseased mature leaves of Cambodia.*

On Oven-dry Basis.

DESCRIPTION.	Mean per cent.		P	Significant difference.
	Healthy.	Diseased		
Nitrogen	1.71	1.21	<0.05	0.39
K_2O+MgO/P_2O_5	4.83	3.99	<0.05	0.73

(*iii*) *Root Activity.*—These differences indicated the inability of the diseased plant to maintain blanced metabolism. A comparison of the root-activity of adjacent pairs of healthy and diseased plants revealed the following differences :—

TABLE 5.—*Differences in Root-activity of Healthy and Diseased Cambodia Cotton Plants at Indore.*

——	Soil depth.	Mean root length in inches.		n	t	P
		Healthy	Diseased			
Active roots ..	12″ downwards.	40.5	6.1	20	3.67	<0.01
Dead roots ..	0-12″	4.8	15.7	20	3.18	<0.01

The active root-length of diseased plants below one foot depth was significantly less and the length of dead roots was significantly greater in the upper foot for the diseased plants than the healthy ones. It appears that the extensive root-death in the upper zone reduces the activity of the roots in the lower zone in diseased plants.

(*iv*) *Soil Condition.*—The concentrations of soil-water from zones around healthy and diseased plants also showed the following interesting differences :—

TABLE 6.—*Mean Osmotic Pressures (Atmospheres) of Soil-water from Zones around Healthy and Diseased Cambodia Cotton Plants.*

DESCRIPTION.	Healthy	Diseased	n	t	P
1. Upper zone 0″-3″	3.59	13.37	10	4.94	<0.01
2. Lower zone 12″-15″	10.37	17.22	10	3.43	<0.01
3. Percentage drop from lower to upper zone	62.86	22.31	10	3.84	<0.01

Osmotic pressures of soil-water were less around roots of healthy plants than diseased ones, at any rate down to a depth of fifteen inches, but the percentage fall in osmotic pressures from lower to upper layers was greater around the roots of healthy plants than diseased ones. This is taken to indicate accumulation of solutes due to poorer mobility in the soil around the roots of diseased plants.

(*b*) *Wilt.*—(*i*) *Periodicity.*—Observations taken during the years 1933-34 and 1934-35, on the periodic fluctuations in virulence of cotton wilt (*fusarium sp.*) have now been examined. Percentage deaths calculated on initial stand for each period are given, with their statistical evaluations in Table 7. Numbers significantly higher than both the preceding and following ones are marked with a double dagger (‡) and those significantly higher than an adjacent number, with a single dagger (†) pointing one way.

TABLE 7.—*Periodic Fluctuations in Wilting.*

Percentage of deaths on initial stand at the beginning of each period.

A. Malvi.

PERIODS.	F. No. 19. 1933-34.	F. No. 11B. 1933-34.	F. No. 19. 1934-35.	F. No. 11C. 1934-35.	F. No. 11B. Seed from diseased plants. 1934-35.	F. No. 11B. Seed from healthy plants. 1934-35.
1st	0	7.8	10.6	13.7	0	0.4
2nd	4.1	5.0	†21.0	‡25.1	21.3	15.3†
3rd	9.2	‡17.5	†27.7	10.2	16.3	14.3
4th	7.6	4.6	‡45.0	7.3	26.1	27.3†
5th	1.0	‡15.6	14.9	7.8	26.5	18.6†
6th	6.9	†8.5	16.1	11.7	5.3	7.5
7th	0	1.9	19.1	..	21.5	25.2‡
8th	5.1	2.7	..	..	9.2	5.0
9th	3.7	0	..	..	19.7	10.3
10th	2.3	0	..	..	5.5	8.4
11th	3.3	†6.9	..	..	5.3	5.2
12th	1.5	†11.2	..	..	..	..
13th	..	†27.0	..	..	..	..
P.	>0.05	<0.01	<0.01	<0.01	>0.05	<0.05
Sig. Diff.	..	3.5	6.4	6.4	..	9.1

B. Verum.

PERIODS.	F. No. 19. 1933-34.	F. No. 11B. 1933-34.	F. No. 19. 1934-35.	F. No. 11C. 1934-35.	F. No. 11B. 1934-35.
1st	0	1.3	7.3	12.2	0.4
2nd	0.8	3.9	9.1	‡21.8	8.1
3rd	2.5	8.1	‡18.1	†5.8	6.3
4th	0	5.2	†14.0	0.6	‡16.3
5th	3.2‡	0	†7.5	1.7	9.3
6th	1.0	0.7	0.5	4.2	2.1
7th	0	0	2.0	..	5.0
8th	0	3.8	†10.7	..	1.8
9th	0	0	..	..	3.7
10th	1.0	0	..	..	1.3
11th	0	0	..	..	2.0
12th	4.4†	0	..	..	..
13th	..	2.9	..	..	..
P.	<0.05	>0.05	<0.01	<0.01	<0.01
Sig. Diff.	2.7	..	3.8	4.3	6.6

C. Roseum.

Periods.	F. No. 19. 1933-34.	F. No. 11B. 1933-34.	F. No. 19. 1934-35.	F. No. 11C. 1934-35.
1st	0	9.8	†10.9	10.9
2nd	5.6	17.7	5.7	†11.2
3rd	3.4	17.6	†19.5	†5.1
4th	3.0	7.6	†18.5	0.6
5th	0	18.8	2.4	3.7
6th	0	12.0	†7.5	3.6
7th	0	0.9	5.2	..
8th	1.3	2.6	8.1	..
9th	1.2	0	..	..
10th	0	2.2	..	..
11th	0	0	..	..
12th	0	6.4	..	..
13th	..	0	..	..
P.	>0.05	<0.01	<0.01	<0.01
Sig. Diff.	..	12.6	4.6	3.4

D. Dharwar 2.

Periods.	F. No. 19. 1933-34.	F. No. 11B. 1933-34.	F. No. 19. 1934-35.	F. No. 11C. 1934-35.
1st	0	5.6	†10.0	4.1
2nd	1.7	9.2	4.7	3.6
3rd	2.4	†13.5	†15.3	2.9
4th	1.6	4.3	†16.9	0.8
5th	2.2	7.1	5.4	0.4
6th	0	3.3	5.8	1.1
7th	0	2.4	2.9	..
8th	0.4	1.0	3.8	..
9th	0.8	1.0	..	..
10th	0	1.1	..	..
11th	..	0	..	..
12th	..	0	..	..
13th	..	1.3	..	..
P.	>0.05	<0.05	<0.01	<0.05
Sig. Diff	..	7.5	4.1	2.5

E. Dharwar I.

Periods.	F. No. 19. 1933-34.	F. No. 11B. 1933-34.	F. No. 19. 1934-35.	F. No. 11C. 1934-35.
1st	0	10.8	11.6	7.1
2nd	†9.1	15.8	10.3	‡11.8
3rd	11.3	†18.6	†21.6	2.1
4th	5.0	6.6	†23.6	1.9
5th	0.6	4.6	8.7	0.6
6th	0.2	5.1	7.2	0.3
7th	0	7.0	6.3	..
8th	0.6	1.5	7.1	..
9th	2.3	0	..	..
10th	0.6	3.0	..	..
11th	0	0	..	..
12th	0.2	1.3	..	..
13th	..	0.7	..	..
P.	<0.01	<0.01	<0.01	<0.01
Sig. Diff.	6.8	7.5	6.1	4.1

It may be noted that (1) periodic fluctuations in death rate may not vary significantly throughout the season; (2) death rate may gradually fall to a significantly lower level as time advances; or (3) the death rate may reach, once or oftener, a significantly higher level than that of either or both the preceding or succeeding periods in different fields or seasons. Different varieties may not always behave similarly under the same conditions. A gradual fall without peak was shown only by Dharwar 2 and Roseum. Dharwar 1 did not show more than one peak. Both resistant and susceptible varieties showed these environmental influences.

Irrespective of season and field Dharwar 1 showed a greater susceptibility than Dharwar 2, but there was no such difference between Verum and Roseum.

Table 8.—*Mean percentage deaths, due to wilt, of resistant and susceptible varieties grown at Indore, irrespective of field and season.*

	Resistant	Susceptible	Resistant.	Susceptible.
	Verum	Roseum	Dharwar 2	Dharwar 1
Mean % deaths.	4.8	6.1	3.7	6.1
	P>0.05		P<0.01;	Sig. Diff.1.8.

Thus it appears that a variety which is commonly classed as "resistant" may be so only under certain environmental conditions. When those conditions are changed it may become susceptible, while under those identical changed conditions the "susceptible" variety may become resistant. The average mortality from wilt at the end of the season at Indore was found to be 63.4 per cent. for Malvi, 52.7 per cent. for Roseum, 50.4 per cent. for Verum, 31.1 per cent. for Dharwar 1 and 20.6 per cent. for Dharwar 2.

(*ii*) *Temperature, humidity and light.*—Most of the deaths occur within the period when the soil-temperature at 6 inches depth was between 25°C and 22°C and at 15 inches between 25°C and 24°C. The temperatures fell later, as also the death rate. This agrees well with Kulkarni's observations in general.*

Within this period a sudden rise in death percentage seems to coincide with the sudden rise in mean duration of sunlight at the end of the monsoon, which rose from two hours to five hours daily.

In the later period, when the soil temperatures were low duration of sunlight made no difference.

(*iii*) *Nutrition and soil texture—Pot cultures.*—In one series of pot cultures in 1934 the soil was mixed with heated soil (at the rate of 60 cartloads per acre/two inches), ferrous sulphate (at the rate of 5 cwts. per acre/two inches) and slaked lime (at the rate of one maund per acre/two inches) in order to change its physical condition. Ammonium sulphate and Nicifos 22/18 grade, (at the rate of 3 cwt. per acre/two inches), farm compost and municipal compost (at the rate of 20 cartloads per acre/two inches) were mixed with each of these. Malvi cotton was sown after infection, which was maintained at the same level throughout the experiment. The results are given in Table 9.

TABLE 9.—*Physical treatments, manuring of soil and wilt-incidence in pot cultures.*

Mean death percentage.

MANURES.	Physical Treatments.		
	Ferrous Sulphate.	Fire-heated Soil.	Slaked Lime.
Nicifos	28.6	11.1	21.1
Ammonium sulphate	26.9	47.8	29.2
Farm compost	23.6	16.7	0
Municipal compost	6.7	25.0	8.3

	P.	Sig. Diff.
Physical treatments	>0.05	—
Manures†	<0.05	16.2
Interaction (physical treatments x manures) ..	>0.05	—

†Ammonium sulphate	Nicifos 22/18	Farm compost.	Municipal compost.
34.6	20.3	13.4	13.3

Nitrogenous treatments increased incidence as reported before (1935), in spite of textural treatments. It is to be noted that the presence of phosphorous (Nicifos) had slightly modified the influence of nitrogen.

(*iv*) *Nutrition and soil texture—Field tests.*—The uniform intensity of treatment in pot cultures is absent in the field where, in addition, interaction of the subsoil plays its part. How far the results of the pot culture are borne out in the field was tested in 1934. A wilt-affected portion of a field was selected and the same physical and manurial treatments were given as in pot cultures, and at the same rates. Malvi seed from healthy and diseased plants of the previous season, and Verum seed from healthy plants was sown. The soil was infected. The data, being voluminous, are not given, but the following table of significance will indicate the influences of the several factors.

* Kulkarni, G. S., (1934), Studies in Wilt disease of cotton in the Bombay Presidency, *Ind. Jour. of Agr. Sci.* Vol. 4, part 6, (pp. 977-1047).

TABLE 10.—*Significance.*

	Verum.		Malvi.		Malvi, Diseased Seed.	
	P.	Sig. Diff.	P.	Sig. Diff.	P.	Sig. Diff.
Periods	<0.05	2.95	<0.05	4.28	<0.05	6.50
Manures	<0.05	1.07	<0.05	1.39	<0.05	1.73
Manures X physical treatments .	<0.05	3.32	>0.05	..	<0.05	4.67
Manures X periods	<0.05	3.20	<0.05	4.2	<0.05	5.12
Manures X physical treatments X periods	<0.05	8.75	<0.05	11.64	<0.05	13.96
Physical treatments	>0.05	..	>0.05	..	>0.05	..
Physical treatments X periods ..	>0.05	..	>0.05	..	>0.05	..

For all varieties, irrespective of treatments, there was a significant rise in the incidence at the second, third and fifth periods. In Malvi plants, both from healthy and diseased seed, municipal compost showed a significantly higher incidence than control and Nicifos. Ammonium sulphate was superior to Nicifos. With Verum, however, ammonium sulphate and farm compost showed the highest incidence, there being no significant differences between farm and municipal compost. The physical treatments in general made no difference, but influenced the behaviour of manures with Verum and Malvi from diseased seed. For all varieties, however, manures influenced the periodic fluctuations and the physical dressing modified that influence.

It is thus clear that under field conditions application of the same manures may give varying results, due to their interaction with the soil conditions and variety grown. Manurial experiments for wilt control have given inconclusive results in the past and will do so in future, unless such experiments are based (1) upon a definite knowledge of the interaction of soil and manure for the locality, and (2) upon equally definite information as to whether the interaction adequately satisfies the intrinsic requirements of the variety grown, estimated independently.

(*v*) *Leaf Composition in wilted and healthy plants.*—Mature leaves of the resistant Verum and susceptible Malvi plants—healthy and on the point of wilting—were collected, boiled in 85 per cent. alcohol and analysed.

The accuracy of this sampling was ascertained by the examination, for the presence of *fusarium*, of thirty plants about to wilt. Transverse sections of (1) the tap root, four inches below the soil surface, (2) the hypocotyl and (3) the second internode of the stem, invariably showed fungus hyphæ in the vascular bundles. All samples, except three, gave growths of fungus identified as *fusarium* species, after incubation on cotton wool soaked in Richard's solution.

A few significant differences in composition are tabulated below :—

TABLE 11.—*Composition of mature leaves of healthy and wilted plants.*

Mean percentages on oven-dry basis.

Description.	Varieties and Conditions.				Significance.					
	Malvi.		Verum.		Varieties.		Conditions.		Varieties and Conditions.	
	Healthy.	Wilted.	Healthy.	Wilted.	P.	Sig. diff.	P.	Sig. diff.	P.	Sig. diff.
Nitrogen	2.36	1.87	2.30	1.65	<0.05	..	>0.01	0.47	>0.05	..
Phosphate (P_2O_5) ..	0.70	0.55	0.93	0.80	<0.05	0.23	>0.05	..	>0.05	..
Magnesia (MgO) ..	1.93	0.12	0.91	0.81	>0.05	..	<0.01	0.66	<0.01	0.93
Ratios :										
Magnesia/Nitrogen ..	0.80	0.08	0.39	0.54	>0.05	..	>0.05	..	<0.05	0.71
Magnesia/Potash ..	1.06	0.12	4.05	0.65	>0.05	..	>0.05	..	<0.05	0.80
Lime/Potash ..	0.81	1.64	0.60	1.15	>0.05	..	<0.05	0.63	>0.05	..
Magnesia/Lime ..	1.54	0.09	0.82	0.71	>0.05	..	<0.05	0.66	<0.05	0.93
$\frac{N+P_2O_5}{MgO.}$	0.61	0.09	0.28	0.36	>0.05	..	>0.05	..	<0.05	0.34
$\frac{N+P_2O_5}{K_2O+MgO.}$ ..	1.26	0.75	0.91	0.94	>0.05	..	<0.05	0.21	<0.05	0.29

The higher phosphate content of the resistant variety, Verum, than that of the susceptible Malvi is noteworthy. The leaves of wilted plants of both varieties showed a deficiency of nitrogen. Besides, the susceptible variety, Malvi, showed a lower content of magnesia when diseased. The ratio of magnesia to nitrogen, potash or lime was also lower. The healthy leaves of both the susceptible and resistant varieties had a lower ratio of lime content to that of potash, while the wilted leaves of the susceptible variety, Malvi, contained a poorer proportion of magnesia and potash with respect to their nitrogen and phosphate content.

(c) *Nutrition in relation to environment—yield.* (*i*) *"Soil-variety," humus and nutrients—Pot cultures.*—Three years' experiments have clearly shown that the nutrition of the cotton plant does not depend only on the kind and quantity of nutrients added to or contained in the soil. Everything else being the same the condition of the soil medium seemed to determine how and to what extent its nutrients might affect the growing plant. For instance, the quantitative pot cultures reported in 1935, where the normal surface soil of Indore was used, showed that the application of nitrogen and phosphate together increased yields of Malvi 9, and Cambodia Indore 1 cottons by nearly five-and-a-half and four-and-a-half times respectively, but in presence of compost the order of these increases was reversed and when the soil was flocculated by acid the increase was only two-and-a-half times and twice respectively. The addition of compost to soils thus flocculated had no further influence on yield. With other nutrients the effect was even adverse when the physical condition of the soil was modified by treatment with compost or acid. In the field Nicifos gave a yield-increase of forty per cent. in Malvi cotton on a well drained soil free from surface wash at Indore, but no such difference was found at Dhar, Malva in a field liable to severe run-off. The Cambodia crop at Dhar actually yielded less with Nicifos.

It became evident that pot-culture studies would be more serviceable to field practice if they included consideration of the possible influences on plant nutrition of the varying conditions existing between fields in the same soil type. The investigation in replicated pot-cultures of the effect of differences in field soils was first taken up in 1935-36. Soils were collected from the first and second horizons in the profiles of the rich field No. 42, the medium field No. 31 and the poor field No. 29, on the Institute Farm. Field No. 42 is scarcely ever affected by surface wash, No. 31 only occasionally but No. 29 is always subject to it. Each horizon was nine inches thick for the rich and poor fields and six

inches for the medium one. The manurial treatments were : compost alone, Nicifos 22-18 (N : P=1 : 1) each at a rate equivalent to 200 milligrammes of nitrogen per kilo, of the soils and both these manures together. Malvi 9 and Cambodia Indore 1 were the varieties grown, and there were four replications of a complex design. After germination the plants were thinned to four per pot, two of which were removed 41 days after sowing for the determination of fresh and dry weights. The other two were retained for subsequent observations on development and yield. The plants were grown only on rains. The total yield results are given below with their statistical evaluations.

TABLE 12.—"*Soil-varieties,*" *manures and cotton varieties.*

Total yields of *kapas* per plant.

A. *Pot cultures—gms. per plant.*

VARIETY OF COTTON.	Soil "Variety."	Horizon.	No Manure.	Compost.	Nicifos 22/18.	Compost and Nicifos 22/18.
Cambodia—	Rich	1	2.7	17.3	13.2	8.3
		2	3.3	7.4	4.8	7.4
Indore 1	Medium	1	7.1	5.8	6.5	5.6
		2	5.5	24.1	8.8	76.0
	Poor	1	2.6	5.6	14.1	14.2
		2	4.9	10.5	11.9	14.5
	Rich	1	0.0	3.1	4.5	3.0
Malvi 9		2	0.8	5.2	13.5	3.3
	Medium	1	6.4	18.4	12.9	7.9
		2	4.4	4.4	19.6	32.7
	Poor	1	0.0	7.0	18.6	37.9
		2	0.6	16.7	8.4	31.3

Significances.	P.	Sig. Diff.
Soil "varieties"	<0.05	5.8
With or without compost	<0.01	7.8
With or without Nicifos 22/18	<0.01	7.8
Soil "varieties" × horizons	<0.05	8.3
Soil "varieties" × horizons × with or without Nicifos 22/18	Nearly sig. on 5% Z value 0.5723; required 0.5951.	14.2

All other differences are non-significant.

B.

Compost.	No Compost.
15.3	7.3

C.

Horizon.	Soil "variety."		
	Rich.	Medium.	Poor.
1	6.5	8.9	12.5
2	5.7	22.0	12.4

D.

Horizon.	Nicifos 22/18.			No Nicifos.		
	Soil "variety."					
	Rich.	Medium.	Poor.	Rich.	Medium.	Poor.
1	7.3	8.3	21.2	5.8	9.5	3.8
2	7.3	34.3	16.6	4.2	9.7	8.2

Compost has all along raised yields. Though the average yield of Nicifos-treated plants was significantly higher than that of the rest, the response to it for different soil "varieties" and their horizons appeared to be different if their interaction, which is almost significant, is considered. The second horizon of the medium soil and the first of the poor one responded significantly to the manure. The yield from the second horizon of the medium soil was significantly higher than all others, manured or unmanured, except that from the first horizon of the poor soil which was superior to both unmanured horizons of the rich soil. Without manure there was no difference in the yields from the different soils. The absence of response to manures in both horizons of the rich soil, the top zone of the medium and the lower zone of the poor one is remarkable and requires further investigation. At any rate these results partly explain why those of pot-cultures in 1934 were not always reproduced in the field. The consistent superiority of compost found when applied to different soils and horizons in this test has so far failed to appear in the field. Perhaps this may be due to the difference in the depth of application. Similar superiority was noted last year for a small field plot when the manure was applied deeper. The greater evaporation in pots kept above ground than in the field, as well as the absence of run-off leading to saturation and mechanical packing of the surface soil occurring in the field, are also possible factors. The 1936 test where the manures are to be applied only to the top three-inch layer may perhaps give a further clue.

The Cambodia plants retained their stand in all the pots but that of Malvi was reduced due to casualties by wilting. A statistical examination brought out some interesting results which are given below :—

TABLE 13.—*Stand for Malvi cotton.*

Mean of 4 pots.

TREATMENT.	Soil "variety."		
	Rich.	Medium.	Poor.
No manure	0.7	1.5	0.2
Compost	1.2	1.0	2.0
Nicifos 22/18	1.5	1.2	1.5
Compost and Nicifos 22/18	0.7	1.5	1.7

Almost significant, Z=0.5806.

Z required=0.5951. Sig. diff.=0.74.

The unmanured rich and poor soils showed most casualties. Both compost and Nicifos 22/18, alone or together, reduced them on the poor soil. On the rich soil, however, the two manures together or compost alone had no effect. Nicifos 22/18 significantly reduced wilt. On the medium soil there was no significant difference but numerically both the manures used singly seem to have slightly reduced the stand. These results seem to corroborate to some extent the findings in field observations on cotton wilting.

The differences observed in stand due to treatment in pots suggested an examination of yields on the basis of all standing plants in each pot, similar to the estimation of plot yield in a field. It was hoped thus to get an indication how far this factor could account for the differences observed between the results of pot and field tests. The result of the examination showed that Cambodia responded to compost best on medium, and Malvi on poor soil and that soil of the second horizon of the medium field appeared to be the best for Cambodia, while that of the first horizon of the poor one was so for Malvi.

These results are similar to those reported last year. It must be remembered that the plants fed themselves throughout their lives in the same "variety" of soil in these pot-cultures, while in the field they do so in the first and second horizons depending upon their thickness, moisture content and the stage of growth of the plants. It appeared that the field behaviour of the plants could be better estimated by imitating in pot-cultures these conditions, using in the same pot known thicknesses of two horizons under test, one above the other. This is being done in the current year.

(*ii*) "*Soil-variety*," *humus and nutrients—field crops*.—The favourable influence of nitrogen and phosphate on the yield of Cambodia cotton observed in pot cultures in 1934-35 could not, as reported before, be obtained in the field either at Dhar (Malwa) or Jaipur in experiments of the same year. The superiority of cake manuring in the Jaipur test, especially for the April-sown crop, suggested the possibility of securing under field conditions the high yields that were obtained in pots, by the use of nitrogen and phosphate in an organic form. An extensive "feeler" test was carried out in 1935-36 in order to ascertain whether there existed in Malwa or Rajputana any possibility of maintaining an

adequate supply of organic nitrogen and phosphate in local soils while the Cambodia cotton was growing, so that reasonably high yields could be obtained as a rule. Two randomised blocks per field were designed for the following places :—

(*a*) *In Rajputana*—

(1) in Jodhpur and Khetri, two fields each,

(2) in Alwar, Jaipur and Bundi, one field each,

(*b*) *In Malwa*—

(1) in Dhar and Jaora one field each,

(2) in Indore two fields.

The treatments were : well-rotted sheep or cattle dung manure applied at 20 cartloads per acre at sowing, with or without a supplementary dressing at the same rate six weeks after sowing. The crop was to be irrigated at each place as required. A variety of crops preceded the cotton crop at different centres and equally varied were the local methods of cultivation. Sowings were done in Rajputana between the 3rd and 13th July and at Indore on 28th June. The results given below are based upon the data obtained from those places where the experiments could be properly carried out.

TABLE 14.—*Yields of rain-sown Cambodia Cotton with Sheep or Cattle-dung manure.*

Total yields of *kapas* in lbs. per acre.

Basal Dressing	Top Dressing	Jodhpur		Jaipur	Bundi	Alwar	Khetri, Mirapur	Indore, I. P. I.
		Bali	Mandore					
Cow-dung ..	None ..	1,467	1,195	949	677	465	554	308
	Cow-dung ..	1,488	1,312	966	701	605	445	357
Sheep-dung .	None ..	1,558	1,236	959	674	765	533	230
	Sheep-dung ..	1,406	1,261	1,140	711	541	406	365

Significances :	P.	Sig. diff.
Places	< 0.05	274.4
Basal dressings :	> 0.05	..
Top dressings	> 0.05	..
All interactions :	> 0.05	..

PLACES.

Jodhpur, Bali	Jodhpur, Mandore.	Jaipur.	Bundi.	Alwar.	Khetri, Mirapur.	Indore, I. P. I.
1,480	1,251	1,003	691	594	484	315

The yields at Jodhpur and Jaipur were much higher than expected for a rain-sown crop, and reached the level of those from hot-weather-sown crops at the same places in previous years, while those at Bundi, Alwar and Khetri were at least equivalent to those usually obtained there with local cotton. These results seem to be significant and are being followed up. The variation of yield from region to region is interesting.

(*d*) *Nutrition in Relation to Environment—Quality.*—Observations on staple-length of the pooled pickings of both Cambodia (Indore 1) and Malvi 9 from the pot culture test of last year have now been statistically examined. The results are tabulated below :—

TABLE 15.—*Soil Texture, Nutrition and Staple Length of Cotton.*

(A) Mean Staple Length in mms.

TREATMENTS.	CAMBODIA—INDORE 1.				MALVI 9.			
	No. treatment.	Compost.	Acid.	Compost +acid.	No. treatment.	Compost.	Acid.	Compost +acid.
None ..	23.3	22.0	22.6	21.3	24.2	21.5	22.8	22.2
N	22.2	23.0	21.8	24.6	24.0	20.6	23.5	24.0
P	19.7	23.4	22.1	24.9	20.0	20.3	20.8	21.5
K	21.9	23.7	22.5	22.1	21.6	19.6	24.0	21.9
NP	17.6	21.5	21.1	22.6	21.0	20.8	23.5	21.5
NK	20.0	22.2	24.4	19.2	19.4	21.1	20.7	20.5

(B) SIGNIFICANCES.

FACTORS.	P.	Sig. diff.	Interaction of first order.	P.	Sig. diff.	Interaction of higher order.	P.	Sig. diff.
a. Varieties	<0.05	..	a×b	<0.01	0.76	d×c×a	<0.01	0.82
b. Texture treatments	<0.01	0.53	c×a	<0.05	0.52	d×c×b	<0.01	1.16
			d×c	<0.01	0.57	d×b×a	<0.01	1.16
						d×c×b×a	<0.01	1.58
c. Presence or absence of nitrogen ..	<0.05	0.38	d×b	<0.01	0.79	..	..	..
			d×a	<0.05	0.58	..	..	..
			c×b	>0.05	..	..	..	..
d. Presence or absence of K or P . ..	<0.01	0.39	..	..	..	..	..	..

According to treatments the mean staple-length for Cambodia (Indore 1) varied between 24.9 and 17.5 mms. while that of Malvi 9 ranged between 24.5 and 19.4 mms.

It is interesting to note that Malvi 9 without any soil-texture treatment gave the maximum staple-length and that of Indore 1 under the same conditions was only slightly lower than its own maximum. Further, the highest yielding treatments did not give maximum staple-length for Malvi 9 but with Cambodia (Indore 1) one only of such treatments (compost+potash) produced a lint-length not significantly different from its maximum.

It may be pointed out that the untreated pots were filled with the loose soil from the surface of fields and moisture supply was equal for all pots, treated and untreated throughout the experimental period, hence the lint-lengths and yields obtained from untreated pots may be taken to represent the capacities of the loose surface soil alone from the fields, not modified by the influence of subsoil.

The probable influence of different soil horizons from fields of different fertility is at present under test. These results clearly indicate, firstly, that under conditions of equal moisture supply, the influence of nutrition on lint-length is profoundly modified by differences in soil texture; secondly, that the texture of surface soils of fields of normal fertility appears to be very nearly ideal for developing to their full length the staples of both *desi* (Malvi 9) and American (Indore 1) varieties under the conditions of soil-moisture supply obtaining in the experiment.

The application of manures seems to disturb the equilibrium. The texture adjustments suitable for each manurial treatment and each variety may differ, probably because of the disturbance in moisture-status of the soil, due to the manured plants' different needs for moisture and also to the changes in the capacity of the soil to handle the moisture supplied owing to the influence on its texture by the growing plant and the applied manures. It is well known that both these factors affect the chemical nature of, and biological activities in the soil.

This, perhaps, explains why different workers came to different conclusions on this subject, some ascribing greater importance to nitrogen, phosphate or a combination of nitrogen and potash, while others emphasized the importance of moisture supply.

The results in field experiments reported last year also support this view.

(*e*) *Cotton nutrition in relation to environment: plant development.* (*i*) *Vegetative growth and vigour—pot cultures.*—In the pot-culture test discussed above total dry weights of the aerial portion of the seedlings 41 days old and those of the stems and leaves separately were determined. The bulky tables of the weights and their statistical evaluations are not given. For both varieties manuring created far greater differences than soil "varieties," in the dry weights for the whole shoot, leaf or stem. With Cambodia Nicifos was more effective than compost which suppressed the effect of Nicifos when used in combination. Compost increased the weights of leaves more than of stems but the effect of Nicifos was nearly the same. The ratios of minimum and maximum weights tended towards equality for both stems and leaves, as their weights increased by treatments. With Malvi 9, however, compost and Nicifos did not differ very much in their effect on leaf-weights whether used alone or together, but Nicifos increased the stem-weight considerably more than compost and the two together still more. This can be briefly illustrated by the comparison of ratios of maximum and minimum values given below :—

TABLE 16.—*Ratios of minimum to maximum values of dry weights.*

A. *Cambodia Indore* 1.

RATIOS.	No. Manure.	Compost.	Nicifos 22/18.	Compost and Nicifos 22/18.
Whole shoot	5	14	29	25
Stem	3	8	27	22
Leaf	6	13	29	27

B. *Malvi* 9.

Ratios.	No. Manure.	Compost.	Nicifos 22/18.	Compost and Nicifos 22/18.
Whole shoot	5	15	18	22
Stem	6	25	34	42
Leaf	5	11	12	15

The maximum increases in plant weights for Cambodia were obtained on the soil from the first horizon of the medium field and those for Malvi from its second horizon.

The ratios of the fresh weights of stems to leaves for each treatment were put to statistical examination. The results are given below :—

Table 17.—*Ratios of fresh weights, stems : leaves Indore* 1935.

A.

Cotton Variety.	Soil "variety."	Horizon.	No treatment.	Compost	Nicifos 22/18.	Compost and Nicifos 22/18.
Cambodia Indore 1	Rich	1	0.33	0.39	0.59	0.52
		2	0.37	0.42	0.30	0.40
	Medium	1	0.32	0.47	0.58	0.46
		2	0.24	0.44	0.45	0.56
	Poor	1	0.36	0.30	0.33	0.43
		2	0.29	0.31	0.40	0.49
Malvi 9	Rich	1	0.31	0.99	0.31	0.76
		2	0.34	0.37	0.26	0.45
	Medium	1	0.18	0.46	0.38	0.63
		2	0.31	0.26	0.56	0.56
	Poor	1	0.27	0.23	0.21	0.51
		2	0.35	0.24	0.35	0.53

Significances.	P.	Sig. diff.
Compost and no compost	<0.01	0.07
B Nicifos 22/18 and no Nicifos	<0.01	0.07
Compost and no compost x cotton varieties	<0.05	0.08
C Compost and no compost x horizons x cotton varieties ..	<0.05	0.11

The differences due to other factors and interactions are non-significant.

B.

Nicifos 22/18.	No Nicifos.
0.46	0.35

C.

Cotton Variety.	Horizon.	Compost.	No. Compost.
Cambodia Indore 1	1	0.43	0.42
	2	0.43	0.34
Malvi 9	1	0.59	0.28
	2	0.40	0.36

The ratios were significantly increased by Nicifos 22/18 for both varieties, irrespective of treatments. With compost, however, the ratio of stems to leaves of Malvi 9 was significantly increased by compost, only on the soil of the first horizons of all fields, but not on the second horizon. For Cambodia, on both horizons, the ratio did not increase irrespective of soil "variety." The effect of the horizons on the ratios was not appreciable except that the first horizons gave higher ratios for Malvi 9 than the second but only when compost treated.

(*ii*) *Vegetative growth and vigour—field crops.*—An attempt was made to ascertain the relation, if any, between growth and yield of cotton plants from bulk crops in the field in 1935. The free soil moisture around the plants at different depths and stages of growth was also estimated. The observations were taken on healthy, vigorous-looking plants, chosen at random in both a rich and a poor field. Some of them have been examined and are discussed below :—

Table 18.—*Fresh Weights in grms. of Malvi Plants*, 1935.

Growing Stage.

Stem-weight.

Date.	Rich field.	Poor field.	P.	Significant difference.
16th to 29th August	11.8	6.4	<0.01	2.5
Leaf-weight.				
24th to 27th August	18.2	9.3	<0.05	3.8
27th to 29th August	21.7	13.0		

Flowering Stage.

Stem-weight.

Date.	Rich field.	Poor field.	P.	Significant difference.
25th September to 12th October ..	56.6	33.8	<0.01	19.8
Leaf weight.				
25th September to 12th October ..	46.8	33.9	<0.05	11.7

Up to the 12th of October the stem-weights of plants were higher in the rich than in the poor field. Afterwards the differences lost their significance. The leaf-weights in both fields showed no difference up to the 24th of August, thereafter they resembled those of the stem-weights. The weights of flowers, buds and unopened bolls did not differ between the two fields at any stage up to December. The yields of *kapas* per plant, however, were higher in the rich field and were found to be highly and positively correlated with the ratios of stems to leaves at growing stage. The weights of flowers, buds and unopened bolls showed a negative correlation with these ratios but it was not significant, as indicated in the following table :—

TABLE 19.—*Correlation between Plant Growth and Yield of Malvi Cotton, Indore*, 1935.

——	A	B	C
FIELD.	Total yield of *kapas*. Average per plant in gms.	Average ratio stem : leaf per plant. Fresh weight—growing stage.	Weight of unopened buds, bolls and flowers at the boll-formation stage, in gms.
Poor	20.9	0–68	61.9
Rich	32.9	0.82	64.5

(1) r for A and B= $+7992\times$, $P>0.01$.
(2) r for A and C= -0.1557, $P.<0.05$.

The moisture content of the soils around the plant was also determined in both the fields at all the stages. The results are expressed on air-dry basis to get as closely as possible an estimate of free water content. The depths of sampling for each stage were chosen to represent approximately the region where most of the roots were expected to function at that stage. Sampling of soils and plants was done on six days in each period and simultaneously in both fields. During boll formation a third depth was sampled, in the rich field only because the other field was not deep enough.

TABLE 20.—*Soil Moistures during Cotton Growth, Indore*—1935.

Mean percentages—Air-dry Basis.

SOIL.	Growing stage, 16th to 29th August.		Flowering stage, 25th Sept. to 12th October.		Boll formation stage, 12th to 30th November.		
"Variety."	3″-6″	9″-12″	3″-6″	12″-15″	6″-9″	12″-15″	18″-21″
Rich	14.3	12.9	14.4	14.4	12.7	12.3	12.5
Poor	17.4	15.8	21.7	20.9	13.2	13.1	..

Up to flowering stage the poor field maintained a higher moisture level than the rich one in both horizons. During the growing stage the moisture fluctuated a little, the

upper zone being either as moist or moister than the lower zone. The moisture gradually diminished during the flowering stage and was then the same for both horizons. At maturity there was no difference in moisture content, either between fields or their horizons.

The differences found in this test between the two fields were in the quantity and nature of plant growth in the early stage and in the content of free water in the soil. Plant growth was equal in later stages in both the fields when, also, moisture was equal. This shows that the soils in the two fields were not deficient in their nutrient content for the growth of Malvi cotton. In spite of this the plants in the poor field failed to secure sufficient nutrition in the early stages—resulting in the production of a lower proportion of stem-weight to leaf-weight than in the rich field, followed by a lower yield of *kapas*. The capacity of the soil in the poor field to hold its initially larger quantity of moisture up to the flowering stage may have some relation to this.

(*iii*) *Root growth and vigour—field crops.*—The differences in root-activity observed between healthy and diseased cotton plants suggested similar observations on plants differing in yield vigour. Pre-rains-sown cotton is often found to yield better than rains-sown. A replicated experiment was hence carried out in 1933 to study the roots of Cambodia and Malvi cotton sown before and after rains. Root examinations were made at three developmental stages and fresh weights of plants were simultaneously recorded. At maturity the weights of monopodial and sympodial parts were taken separately.

Two months after sowing the pre-rains-sown plants gave a higher shoot-weight than the rains-sown. At second picking, i.e., when the maturing stage was coming to an end the superiority in shoot-weight still persisted for the Cambodia variety but not for Malvi. Pre-rains-sown plants of both varieties gave higher weights of monopodial parts than of sympodial ones.

For the two varieties the total weight and that of the monopodia at maturity were proportionate to the total weight at the age of two months.

TABLE 21.—*Correlations* (1933).

Correlations between.	r.	P.
Shoot-weight at two months after sowing and :—		
(*a*) Shoot-weight at 2nd picking	0.9580	<0.05
(*b*) Weight of monopodia at 2nd picking	0.9667	<0.05
(*c*) Weight of sympodia at 2nd picking	0.9021	>0.05

The pre-rains-sown plants of both the varieties produced more bolls and greater weight of *kapas* than those rains-sown.

This was mainly due to the maturing of more bolls and not to heavier ones.

The examination of root-lengths yielded the following results :—

TABLE 22.—*Influence of age and season on root-development of cotton (with special reference to activity and death rate).*

(0-9 inches soil horizon.)

		One month after Sowing.		Two months after Sowing.		At second Picking.	
	Date of sowing.	Malvi.	Cambodia.	Malvi.	Cambodia.	Malvi.	Cambodia.
Total root length (inches)	Pre-rains .	97	127	191	241	99	164
	Rains ..	150	263	253	327	110	134
Length of active roots as per cent. of total.	Pre-rains .	68	69	20	42	5	9
	Rains ..	71	74	31	49	2	6
Length of dead roots as per cent. of total.	Pre-rains .	7	5	53	34	52	44
	Rains ..	8	5	53	35	40	46

Significances.

TREATMENTS.	Total Root length.		Length of Active Roots as per cent. of total.		Length of Dead Roots as per cent. of total.	
	P.	Sig. diff.	P.	Sig. diff.	P.	Sig. diff.
Varieties	<0.01	4	<0.01	6	0.01	6
Sowing dates	<0.05	34	>0.05	..	>0.05	..
Stages of growth	<0.05	41	<0.05	2	<0.05	6
Varieties and stages of growth ..	>0.05	..	<0.05	3	<0.05	8
Sowing dates and stages of growth	<0.05	58	>0.05	..	>0.05	..

The differences due to other treatments are non-significant.

Statistically significant differences in root lengths were restricted to the upper 9-inch zone, which contained the major portion of the total length.

The total root-length reached its maximum two months after sowing. It was always greater for the rains-sown than for the higher-yielding pre-rains-sown crop.

Percentage length of active roots was highest one month after sowing for both varieties, at both sowing dates, while that of dead roots continuously increased with the further growth of Cambodia but with Malvi it reached its maximum two months after owing and then remained constant.

Thus, the differences observed in yield and aerial development between the pre-rains-sown and rains-sown crops were not paralleled by other properties of the root-lengths except the totals for the rains-sown crop at the end of the first and second months from sowing.

Differences in availability of moisture cannot account for the greater root-length of the rains-sown crops. This seems to be due to different quantities of nutrients for every unit of soil surface tapped. The struggle of the rains-sown plants for adequate nutrition seems to be only partially successful and it seems to be more intense one month after sowing than later. Rains-sown Cambodia is presumably more handicapped than Malvi. This is illustrated in the following table.

TABLE 23.—*Root Development in relation to Plant growth of rains-sown and pre-rains sown crops.*

Ratios of values of rains-sown to those of pre-rains-sown crops.

VARIETY	Total Root length.		Fresh Weights.	
	One month after sowing	Two months after sowing	Whole shoot two months after sowing.	Monopodia (at second picking).
Malvi	1.5	1.3	0.6	0.8
Cambodia	2.0	1.4	0.8	0.6

The results of the studies in nitrogen changes also seem to agree with this suggestion as far as nitrogen is concerned. Attempts to keep the nutrition level of soil high for at least two months after sowing the cotton crop are likely to be a fruitful line of investigation.

(*iv*) *Soil moisture and crop growth in unirrigated lands of Rajputana.*—In most parts of Rajputana cotton is usually grown with one or two post-rain irrigations. An attempt was made to find how far the soil moisture level could be kept high enough to produce a fully developed unirrigated crop. In 1934, a test on duplicate plots was carried out with cotton and other crops. The treatments used and results obtained are given below :—

TABLE 24.—*Moisture-conserving treatments and yield of kapas, Jaipur* 1934.

Lbs. per acre.

No TREATMENT.	Compost.	Bunding and Intercultivation.	Bunding, Intercultivation and Compost.	Weeding.
356	509	368	460	420

Compost was added at the rate of 5 cartloads per acre.

The rainfall for the season was 20.83 inches. There seemed an indication of clean weeding or a light dressing of compost having the desired effect.

In 1935 a replicated experiment was designed to test the immediate and cumulative effect of the following treatments on cotton and other rotation crops :—

Main treatments.—

1. No bunding.
2. Contour bunding at 100 ft. distance.
3. Contour bunding at 50 ft. distance.

Sub-treatments.—

1. No manure.
2. Compost at 5 cartloads per acre.

There were six replications of the experiment. The rainfall was 19.63 inches for the season, the crop suffered from drought in the month of August, i.e., during most of its growing stage, and the yields were abnormally low.

The results, however, are interesting.

TABLE 25.—*Moisture-conserving treatments and yield of kapas, Jaipur* 1935.

Lbs. per acre.

A.

CONTOUR BUNDING AT.	With Compost.	Without Compost.
100 ft.	90.4	39.9
50 ft.	67.3	30.3
No bunding	75.3	29.1

B.

With Compost.	Without Compost	P.	Sig. diff.
77.7	33.1	<0.01	20.1

Other differences are not significant.

It is interesting that the results of both years are similar and that a dressing of compost only at five cartloads per acre has given strongly significant differences. The similar effect of a light dressing of compost has been observed in another experiment reported later.

Soil moistures and plant weights at different stages of growth have been taken in this test, which is being continued with slight modifications.

10. *Crops other than cotton*—This has been omitted as it does not deal with cotton.

11. *Statistics and field trial technique.*—The statistical work undertaken during the year has been primarily that necessary for the proper design, conduct and analysis of the experiments referred to under other heads. The field technique of progeny-row testing has been further developed, in particular by the arrangement of progenies in compact family blocks, in order to deal with problems of increasing importance involving the comparison of variances. Methods of studying the relation between root-disease incidence and root morphology have been developed for studies in the genetics of wilt resistance at Indore and root-rot resistance at Baroda.

Statistical work in connection with out-station variety trials has been continued and a paper on the results of variety testing in Central India and Rajputana has been accepted for publication in "Agriculture and Livestock in India." The technique employed has been developed into a coherent programme, from preliminary small-growth tests at selected stations to widely distributed trial-cum-demonstration blocks on cultivators' fields in which varieties proved satisfactory on State farms are further tested and demonstrated simultaneously under a wide range of conditions under the cultivator's own eye. This programme is the subject of a paper now in preparation.

In connection with the improvement of plant breeding methods, a study was made, and is in course of publication, of the effect of selection by current plant breeding methods on the material from which the highly successful cotton strains, Malvi 1 and Malvi 9, were isolated. The conclusions were drawn that though the breeding project had been very successful, its success could only be ascribed in very small measure to the methods of selection used, and that a large amount of genetic variance in commercial characters easily detectable by the replicated progeny-row method of breeding had escaped notice during the years when non-replicated progeny-row breeding was in use.

The statistical work of the section has been extended to parts of India not normally served by the Institute. Advice to the Cotton Root-Rot Scheme* in progress in Baroda has been continued, and the improved experimental methods devised have borne fruit in the isolation of strains resistant to root-rot, and in the evaluation of their commercial characters. At the request of the Director of Agriculture, United Provinces, the Geneticist and Botanist spent a week in Cawnpore studying the cotton breeding work in progress there. In his subsequent report he emphasised the need for a closely co-ordinated testing programme embracing all stages of development from the plant breeder to the officers in charge of propaganda and distribution. In collaboration with the Statistical Assistant he drew up a draft experimental programme for the current season which has been adopted by the Director of Agriculture.

The Geneticist and Botanist's visit to Cawnpore facilitated close collaboration between the Economic Botanist on Cotton to the United Provinces Government and the Institute in the development of the Bengals Improvement Scheme † in North Bikaner, and the best products of the Bundelkhand and Rohilkhand Cotton Surveys ‡ will be grown in the current season in replicated progeny rows at Cawnpore, Raya, Sriganganagar and Indore. Some of the improved Bengals selections collected for growth in the Bengals Improvement Scheme have also been shared with the Economic Botanist on Cotton at Cawnpore.

There appears to be a growing interest in the development of the application of statistical methods to breeding problems. In addition to maintaining a considerable volume of research correspondence, training has been given to two voluntary students for the whole year, and two others for periods of about six weeks each. A fifth has recently joined, and intends to stay for a year.

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† Financed by a grant from the Indian Central Cotton Committee to the Bikaner State Department of Agriculture.
‡ Financed by a grant from the Indian Central Cotton Committee to the United Provinces Department of Agriculture.

12. *Miscellaneous.*—(*a*) *Scope for manuring of crops.*—Several experiments are in progress to compare the utility of green manuring, application of cattle manure or compost or of artificials, singly or together, on cotton, rice, wheat, sugarcane and other crops according to the special requirements of each locality.

(*i*) *Unirrigated black cotton soil tracts in Malwa.—Composts.*—Immediate and cumulative effect on normal rotation crops: Indefinite and non-significant results were obtained from several one-season trials comparing the manurial value of composts for unirrigated cotton and groundnut. The response was more definite for *jowar* and irrigated wheat.

TABLE 46.

Response of crops to compost.

Lbs. per acre.

A. *Jowar—local Malvi* (1933).

Yield of	Municipal compost.	Farm compost.	No manure.	P	Sig. diff.
Grain	1,012	906	837	<0.05	105
Kadbi (dry.) ..	7,762	4,812	4,512	<0.05	1,065

B. *Variety—Wheat, Pusa* 12, *irrigated once* (1932).

Yield of	Compost.		Municipal compost.		Ammonium sulphate.		P.	Sig. diff.
	Nitrogen, lbs.		Nitrogen, lbs.		Nitrogen, lbs.			
	36.72	110.16	36.72	110.16	36.72	110.16		
Grain ..	1,358	1,874	1,343	1,830	1,063	1,240	<0.05	375
Bhusa ..	1,564	2,170	1,465	2,216	1,275	1,509	<0.05	528

A long-term experiment was, therefore, started in 1933 in order to study the problem further and to find out the cumulative effects, if any, of the manures. The technique for making rain-watered compost produces it at the end of the rainy season, hence the test included its application to fields as soon as it was ready, to find whether the usual pre-rains application would differ in efficacy for *rabi* crops from post-rains application. The experiment was located in two fields of medium fertility, one of them well-drained and the other with defective drainage. Rain-watered compost from ordinary farm wastes and that from habitation wastes (municipal compost) were annually applied at twenty cart-loads per acre, the high rate being purposely adopted to secure rapid results, as significant increases in yield had never been obtained by applications at a rate lower than 20 cart-loads per acre. When applied after rains the manure was ploughed into the

moist soil but it was mixed with the loose surface soil by a *bakhar* when applied to the hard dry soil before rains. The sequence of crops in the rotation was, *jowar*, groundnut, cotton and wheat. Some of the results are given below :—

TABLE 47.

Efficacy of Compost Manuring on Black Cotton Soil of Medium Fertility, at Indore.

Yield—lbs. per acre.

A.

Crop.	1934-35.	1935-36.	P.	Sig. diff.
Jowar	305	946	<0.01	330
Groundnut	403	984	<0.05	324
Wheat	562	513	>0.05	..

B.

Crop.	Municipal compost.		Farm compost.		No manure.	
	1934-35.	1935-36.	1934-35.	1935-36.	1934-35.	1935-36.
Jowar	319	1,012	320	928	248	848
Groundnut ..	515	1,062	351	983	282	827
Wheat	601	604	559	469	525	467

Seasons x manures P.>0.05

C.

Groundnut (1934 and 1935).

Municipal compost.	Farm compost.	No manure.	P.	Sig. diff.
788	667	555	<0.01	108

D.

Groundnut (1934 and 1935).

Time of manuring.	Field No. 1 with defective drainage		Field No. 18 well-drained.		P.	Sig. diff.
	Municipal compost.	Farm compost.	Municipal compost.	Farm compost.		
Before rains ..	958	823	767	552	<0.05	134
After rains ..	849	673	578	622		

E.

Wheat (1934 and 1935).

Date of manuring.	Field No. 1 with defective drainage.			Field No. 18 well-drained.			P.	Sig. diff.
	Municipal compost.	Farm compost.	No manure.	Municipal compost.	Farm compost.	No manure.		
Before rains .	728	623	589	430	422	404	<0.05	61
After rains ..	838	805	603	458	471	446	<0.05	127

F.

Crop.	Municipal compost.	Farm compost.	No manure.	P.	Sig. diff.
Jowar	663	624	548	> 0.05	..
Cotton	629	563	527	> 0.05	..

Change of season did not affect the influence of the composts on *jowar*, groundnut and wheat. The results of the cotton crop are available only for one season. Significantly increased yields were obtained only with groundnut and wheat by compost application.

For groundnut, municipal compost was superior to farm compost, the application of which also increased yields on both the fields. Municipal compost was superior to farm compost on the field with defective drainage irrespective of date of application. It was so on the well-drained field only when applied before rains. Under well-drained conditions pre-rains application of municipal compost proved superior to post-rains application, but there was no such difference when the drainage was defective. The behaviour of farm compost was exactly the reverse.

For wheat, the only yield increases obtained were on the field with defective drainage, due to post-rain application of farm compost and to both applications of municipal compost.

The cotton crop did not appreciably respond to manuring.

The experiment needs to be continued before final conclusions can be drawn. It may be that the cumulative effect is not yet intensive enough to show appreciable differences, but the results explain why the proposition of manuring unirrigated crops is usually unattractive to the cultivator though the deficiency of his soil in organic matter is universally acknowledged by the scientific worker, on the basis of his analytical results, and is apparently supported by the high-yielding power of garden land. Farm compost was effective on wheat, and its favourable effect on groundnut was further enhanced, when applied in the beginning of their cropping season and on soil with defective drainage alone. This seems to indicate that the only thing that matters is the physical condition of the upper-most soil-layer existing when the crop begins its life. It is also interesting to note that municipal compost was similarly effective on wheat only on ill-drained land, but irrespective of the date of application, and it was much more effective on groundnut when applied before rains than after. It is not possible to say definitely, on the basis of the present data, whether these two manures differ in their power to improve tilth or

whether their different effect is due to their chemical composition. Perhaps, however, the absence of any such difference on the well-drained field gives a clue. Differences in nutrient composition of the manures should ordinarily be expected to be operative even there; and it is well known that the adverse effect of defective drainage may reach almost to the soil surface, the main difference between a well-drained and an *ill*-drained field being in the depth to which good tilth exists below the surface. Naturally, if the soil tilth under field conditions reaches the required standard in the horizon occupied by the crop concerned, it is not likely to be markedly benefited further by applications of humidified organic matter. Crops like wheat, which need deep tilth to start with, respond to such manuring only when that tilth is absent, as usually happens with ill-drained fields. Such response is more vivid when the manure is applied after rains because the improvement in tilth is then not subject to the deteriorating influence of the wet season. The groundnut crop requires deep tilth to be maintained till the pod-development is complete. It is, perhaps, because of this that it responds to manuring even on well-drained land, as the soil tilth in all fields is lowered by the end of the wet season. Application of organic matter, irrespective of dates, is always useful. The application of farm compost before rains is beneficial on fields with defective drainage but municipal compost also on well-drained land. This, perhaps, indicates a greater flocculating power in this compost. The higher yields obtained on the field with defective drainage with each treatment may be more due to better moisture retention after the rains because of tilth improvement, than to the nutrients. On the well-drained land, with its initial better texture, any improvement would be less pronounced.

Green manuring—influence of different methods on wheat.

It has already been reported that while green manure might benefit a succeeding wheat crop, its favourable effect was problematical on the following cotton crop. The points awaiting settlement in this problem appear to be :—

(*a*) Whether green manuring would be equally beneficial to wheat in a year of low rainfall.

(*b*) Whether it would make any difference if the green manure is ploughed in at different stages of growth, or only laid flat on the soil surface, or cut and removed.

(*c*) Whether the most suitable green cover crops—*sann* and cowpea for the Malwa tract—differ in their manurial value.

(*d*) Whether green manuring for wheat as a system in the rotation will show a cumulative effect sufficient to benefit the cotton crop also.

Two tests, one in 1933 on medium land and the other in 1934 on rich land were carried out at Indore, testing the effect on wheat of green manuring with *sann* in the different ways set out below :—

Treatment.	Approximate intervals from sowing, in weeks.	
	1933 test.	1934 test.
No green manuring	..	..
Seedling crop ploughed in	4	..
Ploughed in at growing stage	8	6
Cut and removed at growing stage	..	6
Ploughed in at flowering stage	12	10
Cut and removed at flowering stage	12	10

Both these years were very wet (51.82 and 57.50 inches respectively). Hence, the test was repeated in 1935 in a modified form. The rainfall of this year was moderate (34.35 inches). The treatments in this test were :—

Main treatments :—
Fields—(1) defective and (2) free drainage.

Sub-treatments A :—
Kinds of green manure (1) *sann*, (2) cowpea.

Sub-treatments B :—
Approximate time in weeks after sowing and method of application at each time.

(*a*) *Periods for :—*
(1) Six weeks after sowing.
(2) Eight weeks after sowing.
(3) Eleven weeks after sowing.

(*b*) *Methods for :—*
(4) Cutting and removing.
(5) Cutting and spreading.
(6) Ploughing in.

The last treatment was omitted for the eleven-week period for obvious reasons. The results are :—

TABLE 48.

Green manuring with Sann for wheat.

Lbs. per acre.

A. 1933 *test* (*medium land*).

Treatment.	Grain.	*Bhusa.*
No green manuring	746	1,463
Seedling crop ploughed in	909	1,401
Ploughed in at growing stage	587	1,335
Ploughed in at flowering stage	571	1,074
Cut and removed at flowering stage	564	1,202
P.	<0.05	<0.05
Significant difference	231	218

B.

1934 *test* (*rich land*).

Treatment.	Grain.	*Bhusa.*
No green manuring	933	1,121
Ploughed in at growing stage	1,063	1,251
Cut and removed at growing stage	978	1,144
Ploughed in at flowering stage	1,004	1,477
Cut and removed at flowering stage	997	1,285

C.

Bhusa.

No green manuring.	Ploughed in	Cut and removed.	P.	Sig. diff.
1,121	1,364	1,214	<0.05	170

D.

1935 *test* (*poor land*).

Treatments.		Well-drained field.		Field with defective drainage.	
Interval in weeks from sowing.	Method of green manuring.	Kind of green manure.			
		Sann.	Cowpea.	*Sann.*	Cowpea.
6	Cut and removed	252	388	148	280
	Cut and spread	340	280	156	316
	Ploughed in	208	420	260	668
8	Cut and removed	400	440	168	256
	Cut and spread	240	356	196	344
	Ploughed in	284	452	284	480
11	Cut and removed	368	424	140	612
	Ploughed in	424	384	180	468

E.

Kind of green manure.	Well-drained field.	Field with defective drainage.	P.	Sig. diff.
Sann	314	191	<0.05	100
Cowpea	393	428		

F.

Cut and removed.	Cut and spread.	Ploughed in.	P.	Sig. diff.
291	278	382	<0.05	78

In the very wet season of 1933 green manuring on a medium field had adversely affected the yields of grain and straw. This harmful effect increased with the period allowed for the green crop to grow. The depressing effect was visible even when the green manure was cut and removed. There was no depression in yields when the green manure was ploughed in during its seedling stage.

Grain yields were not appreciably affected by green manure on fertile land, whether ploughed in or cut and removed, irrespective of its stage of growth. Ploughing in the green manure, irrespective of its stage of growth significantly increased the yields of *bhusa*, but when the green crop was cut and removed the increase was not appreciable.

In a season of moderate rainfall, 1935, different methods of manuring with *sann* or cowpea were compared on poor land with or without good drainage. The cowpea crop behaved equally well on both types of land but *sann* fared better under well-drained conditions. On ill-drained land cowpea was superior to *sann* but no such difference was observed under good drainage. Both the green manures proved better when ploughed in.

These results indicate that under local conditions green manures may depress yields even when moisture supply is sufficient. This seems to be due to unfavourable physical condition of the soil preventing aerobic decomposition.

The superiority of the coarse and woody cowpea to the soft *sann* observed on ill-drained, poor land lends support to this view. Further, ploughing in the green manure when the season is not too wet is likely to be beneficial, at any rate, on poor land. The favourable results of green manuring reported last year were obtained in a wet year on well-drained medium land which was protected from surface run-off. It seems that soil condition and not deficiency of moisture limits the efficacy of green manuring for *rabi* wheat in Malwa. Chances of successful green manuring may increase if surface wash is prevented while the green material is still rotting.

(*ii*) *Unirrigated soils of Rajputana.—Manuring methods.*—In addition to the use of green manures and farmyard manure it is common in this area to tether cattle in the dry season in different portions of a field by turns. The droppings and urine are left *in situ* to be incorporated with the soil during routine cultivation. In 1934 a qualitative experiment in duplicate plots was carried out at Basi Farm, Jaipur State. The local cattle-folding method described above was compared with the modification developed at the Farm in which the dung and urine-earth was uniformly spread and mixed with the soil daily. These were further compared with dressings of cultivator's usual manure, compost and a complete inorganic manure, applied in quantities equivalent in nitrogen content to that in the dung alone dropped in the field during cattle-folding. The nitrogen supplied as urine was not taken into account for this purpose. An additional treatment for comparison was the dressing of complete inorganic manure at one-fourth the rate of the dose mentioned above. The local variety of cotton was grown with an irrigation in the early stage and another in October. The results are given below. The sequence of treatments in the table is based on their numerical superiority in total yields.

TABLE 49. *Efficacy of different methods of manuring.*
Yield of seed-cotton.—lbs. per acre.
Variety—*Desi* cotton (local.)

Treatment.	Pickings.						Total.
	1st	2nd	3rd	4th	5th	6th	
Compost	93	105	185	288	219	99	989
Cultivator's method of bullock folding ..	100	116	170	258	222	108	974
Basi Farm method of bullock folding ..	90	100	169	294	196	86	935
Cultivator's manure ..	54	82	141	260	219	138	894
Artificial manure, full dose	92	85	163	245	193	99	877
Artificial manure, one-fourth dose	46	58	116	294	196	84	794
Control (no treatment).	52	64	105	158	145	95	619

It seems that organic nitrogen has proved superior to inorganic, similarly using well-rotted organic matter instead of half-rotted or unrotted residues appears to be more desirable. Dung and urine when uniformly distributed in the soil showed no advantage over the current method of cattle-folding where urine soaks in patches and most of the dung is removed by beetles and white ants before it can become incorporated in the soil by cultivation. Earliness seems also to be associated with the higher yielding treatment. A vigorous start followed by uninterrupted development seems to be the result of such treatment.

These results are being followed up by a quantitative field trial of a complex design including the following treatments.

Main treatments.

(1) Control (no treatment).
(2) Urine alone supplied by cultivator's cattle-folding, the dung being removed and weighed.
(3) Basi modification of cattle-folding.
(4) Compost, full dose—rate equivalent to nitrogen in full artificial manures.
(5) Compost, quarter dose.
(6) Complete artificial manures—rate equivalent to nitrogen in dung supplied by cattle-folding.
(7) Complete artificial manures, quarter dose.

Sub-treatments.

(1) Control (no treatment).
(2) Green manuring with *guara* ploughed in at flowering stage.
(3) Green manuring with *guara* cut and removed at flowering and weighed (to be used for fodder).
(4) Green manuring with *sann* as in (2).
(5) Green manuring with *sann* as in (3).
(To be used for cattle bedding).

An intensive rotation of wheat and cotton, both irrigated, has been adopted for this test.

The results for wheat are available and are tabulated below :—

TABLE 50. *Efficacy of different methods of manuring.*

Yield of wheat (local) grain—mds. per acre.

Basi Farm, Jaipur, 1935-36.

Treatment.	No green manure treatment.	*Guara* ploughed in.	*Guara* cut and removed.	*Sann* ploughed in.	*Sann* cut and removed.	Mean.
Control	15.8	14.4	15.5	16.6	9.7	14.4
Cultivator's cattle-folding ..	20.9	20.2	14.8	15.1	16.9	17.6
Basi modification of cattle-folding	24.1	20.8	16.6	20.5	14.4	19.3
Compost, full dose	21.2	24.9	19.4	25.2	16.6	21.4
Compost, quarter dose	17.3	19.4	14.4	15.1	15.1	16.3
Artificial manure, full dose ..	25.9	21.6	21.6	25.2	20.9	23.0
Artificial manure, quarter dose ..	19.1	14.8	17.3	16.9	9.4	15.5
Mean	20.6	19.4	17.1	19.2	14.7	..

Significance.	P.	Sig. diff.
(*a*) Basic manuring	<0.05	5.6
(*b*) Green manuring	<0.05	3.0

Interaction is not significant.

TABLE 51. *Efficacy of different methods of manuring.*

Yield of wheat (local) *bhusa*—mds. per acre.

Treatment.	No green manure treatment.	*Guara* ploughed in.	*Guara* cut and removed.	*Sann* ploughed in.	*Sann* cut and removed.
Control	46.1	34.6	46.4	46.8	26.3
Cultivator's cattle-folding ..	68.4	57.6	45.7	58.3	45.0
Basi modification of cattle-folding	63.7	49.7	62.7	54.4	43.2
Compost, full dose	63.7	63.0	54.0	62.7	45.4
Compost, quarter dose ..	57.6	52.6	40.3	41.0	39.6
Artificial manure, full dose ..	80.7	64.8	64.8	69.9	56.9
Artificial manure, quarter dose.	61.6	43.6	49.0	50.8	32.4
Mean	62.6	52.3	51.8	54.8	41.3

Significance.	P.	Sig. diff.
Green manuring	<0.05	9.3

Other factors are not significant.

The response of wheat to the manurial treatments may differ from that of cotton in some respects. It is, however, significant that only compost and artificial manures in full dose could significantly increase the grain yields, in contrast with both the cattle-folding treatments. Ploughing in green manure did not alter the effect of treatments but when it was cut and removed the treatment yields were actually lowered.

Straw yields were not affected by any treatment except the ploughing-in of the *guara* crop and the removal after harvest of both the green manures which adversely affected yield.

Concurrently with this test another field trial was carried out in duplicate plots simultaneously at six places in Rajputana, with a view to ascertain whether it made any difference on the yields of the subsequent wheat crop if (1) cattle manure is applied in the beginning of the *kharif* season or at the end of it, before the *rabi* cultivation, (2) whether a supplementary ploughing-in, or harvesting and removal of green manure grown *in situ* will have any further effect. The results are given below :—

TABLE 52.—*Efficacy of different methods of manuring.*

Yield of wheat (local) grain—mds. per acre.

Places.	Cattle-manuring.					
	Kharif.			*Rabi.*		
	Green Manure.					
	Ploughed in.	Removed.	None.	Ploughed in.	Removed.	None.
Alwar	18.3	17.9	12.4	18.0	18.5	14.4
Jaipur	29.3	30.6	29.3	30.3	25.6	27.5
Jodhpur	20.4	22.9	21.8	21.6	19.1	16.9

Significance.	P.	Sig. diff.
(*a*) Places	<0.05	5.46

TABLE 53.—*Efficacy of different methods of manuring.*

A.—*Yield of wheat (local) bhusa, mds. per acre.*

Places.	Cattle-manuring.					
	Kharif.			*Rabi.*		
	Green Manure.					
	Ploughed in.	Removed.	None.	Ploughed in.	Removed.	None.
Alwar	30.5	30.8	22.4	28.6	30.8	24.9
Jaipur	71.8	70.5	60.5	73.9	57.5	63.6
Jodhpur	32.0	29.4	29.8	28.1	25.8	23.1

Significances.	P.	Sig. diff.
(*a*) Places	<0.05	20.93
(*b*) Time of application of cattle-manure	<0.01	2.25
(*c*) Green manuring	<0.05	4.40
(*d*) Places and time of application of cattle-manure	<0.05	2.12

The remaining differences are not significant.

B. (*c*) *Green manuring.*

Ploughed in	Removed.	None.
44.1	40.8	37.4

C.

(*d*) *Places, Time of application of cattle-manure.*

Cattle manure applied in	Alwar.	Jaipur.	Jodhpur.
Kharif	27.9	67.6	30.4
Rabi	28.1	65.0	25.7

As far as the grain yields are concerned it is immaterial whether cattle manure is added in the beginning or at the end of the season. Yields remain unaffected whether green manure is grown in addition and ploughed in or removed.

The yield of straw is increased, except at Alwar, when cattle manure is given in the *kharif* and it is further increased when in addition green manure is ploughed in.

Yet another experiment was carried out on the estates of Messrs. the Bundi Agricultural Syndicate, Bundi State, in order to test the possible advantage of supplementary dressings of artificial manure after ploughing green manures in the land intended for wheat. Two grades of Nicifos were applied at one and two cwts. per acre.

TABLE 54. *Efficacy of different methods of manuring.*

A.

Variety—Local wheat.

Mds. per acre.

Treatment.	Grain.			Straw.		
	Area B.	Area E.	Area H.	Area B.	Area E.	Area H.
Control	29.4	28.3	32.8	40.0	44.5	46.4
Nicifos 22/18 at 1 cwt./acre ..	35.3	40.8	39.5	67.2	65.8	70.0
Nicifos 22/18 at 2 cwts./acre ..	32.0	43.9	38.1	76.1	73.7	71.1
Nicifos 17/45 at 1 cwt./acre ..	32.3	40.2	42.2	40.8	61.2	66.6
Nicifos 17/45 at 2 cwts./acre ..	37.2	39.4	42.3	73.4	81.2	80.5

Significances	Grain. P.	Grain. Sig. diff.	Straw. P.	Straw. Sig. diff.
(*a*) Manure *vs.* no manure ..	<0.05	6.9	<0.01	14.8
(*b*) Units of manure	>0.05	..	<0.01	13.2
(*c*) Soil types	<0.05	4.9	>0.05	..

All other differences are not significant.

B.

	Artificial manure *vs.* no manure.		Units of manure.	
	Manure.	No manure.	One cwt. per acre.	Two cwt. per acre.
Grain	38.6	30.2	..	..
Straw	69.0	43.6	61.9	76.0

Both grades of Nicifos were equally effective in increasing the yields of grain and straw. Increased rate of application from one to two cwts. did not influence grain yield but the production of straw increased with the rate of manuring.

The results enumerated above are of great practical value for the Rajputana cultivator whose soils require manure even for unirrigated crops and whose resources of vegetable

residues for making manure are limited. Cattle urine can be utilized by the current method of folding. The droppings, which have no additional manurial effect in the system, can be made into compost together with other available residues, to be applied to fields where cattle are not tethered or folded.

Green manuring, if judiciously used, has its place and it does not seem to be always necessary to plough it in. It will then be possible to secure material for composting from a *sann* crop and green fodder from *guara*. The contradictory results of the effect of green manure cut and removed as obtained in the above experiments demand further study before the exact conditions can be defined which produce the crop depression. Artificial manures can also be used singly or to supplement green manure. Thus, a great variety of resources are open (subject to economic limitations discussed below) to the local cultivator for satisfying the manurial needs of his land.

Economics.—The relative scope for cattle-folding, application of compost or artificial manures has been discussed above in the light of crop response. From a practical point of view it is equally important to take into consideration the cost involved. Such records are available mainly from the Jaipur experiments.

TABLE 55. *Costs for different methods of manuring.*

Rupees per acre.

Year.	Farmer's manure.	Compost from		Cultivator's cattle folding.	Basi modification of cattle-folding.	Artificial manures.	
		Dung alone.	Dung and residues.			Full dose.	Quarter dose.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1934 ..	1 6 1	..	4 4 9	..	2 9 3	31 6 0	7 13 6
1935 ..	..	3 4 9	0 10 8	..	2 2 3	25 15 0	6 7 9

Note:—(1) Rates lbs. per acre :—
Compost : 1934—6,600 lbs.
1935—*Full dose*—12.320 lbs.
Quarter dose—3,080 lbs.

(2) Artificial manures :—
1934—a mixture of Nicifos 22/18 at 296 lbs. and pot. sulph. at 111.2 lbs. per acre.
1935—*Full dose.*—Nicifos 17/45 at 118¼ lbs., amm. sulph. at 174.6 lbs. and pot. sulph. at 110 lbs. per acre mixed together. *Quarter dose.*—One-fourth of the above quantities.

Details of cost.—Farmer's manure.—Ten cartloads (120 mds.) of the manure were made according to the cultivator's usual method. The costs involved were : ½ cost of making pit 2 as., charging 3 as., carting Re. 1-9 and spreading 4 as., Total Rs. 2-2.

Cultivator's cattle-folding.—No cost was involved because the land gets the treatment during routine cattle management.

Basi modification of cattle-folding.—The only cost involved is for mixing the dung and urine earth uniformly with the soil. Folding was done in 1934 with three bullocks, one buffalo and one cow on a 1/55 acre plot for three days. The cost for spreading was 9 p. for the plot.

In 1935 four cows and four bullocks were tethered on a 1/44 acre plot for three days. The cost involved was 9.3 p. per plot.

Farm compost making.—Ten cartloads (120 mds). were made in 1934 by the standard Indore method. The costs involved were: ⅛ cost of making pit, 4 as., charging 6 as., watering Re. 1-2, turning Rs. 1-12-6, collection of bedding Re. 1, carting Rs. 1-9, and spreading 4 as. Total Rs. 6-5-6.

In 1935, 466.3 mds. of bedding were composted by the rain-watered process with 155.5 mds. of dung which produced 513 mds. of ripe compost. The costs involved were: collecting and removing the dung from fields Re. 1-8-4, charging heaps Rs. 5-0-8, and turnings Rs. 2-12-0. Total Rs. 9-5-0. Rate of wages for one-man-day of 8 hours = 4 as.

No cost is incurred by the cultivator's folding and there was no significant difference between the yields obtained by this method and by the quarter rate of compost. The yields obtained by both these methods were not significantly different from those obtained by applying compost at a higher rate. Unlike the Basi method of folding, the cultivator's method enables all the dung to be used for making compost. Hence, by adopting a system in which the cultivator's method of folding is used to manure as much land as may be possible with the available number of cattle and manuring the rest with compost made from the spare dung, it is possible to manure, for each acre given the folding treatment, fourteen acres more with compost applied at the lower rate, provided the amount of other residues is sufficient. Even when no farm wastes are available—a rare occurrence—and the dung alone is composted, 3.3 additional acres of land can easily be manured with it.

It is necessary, however, to ascertain the cumulative effects of these treatments both on cotton and wheat before final conclusions are drawn.

The results from Bundi reported above show that an average increase of about eight-and-a-half maunds of wheat per acre over the yield obtained by green manuring is possible by a supplementary application of either of the two grades of Nicifos at one cwt. per acre, involving a cost of Re. 8-3. The gross value of wheat at Rs. 3 per maund will be Rs. 25-8 per acre, leaving a net difference of Rs. 17-5.

(*iii*) *Irrigated arid soils of Rajputana.*—During the last four years experiments have been carried out on cotton and other crops in the Gang Canal Colony, Bikaner, to find out the extent of profitable use of green manures, compost and artificial manures—singly or in association—and their relative values in this respect. Some of the results are tabulated below:—

TABLE 56. *Response of local crops to manuring.*

Gang Canal Colony, Sriganganagar, Bikaner.

Lbs. per acre of grain for *toria*, wheat and *til*, *kapas* for cotton and tons per acre for maize and cowpea mixed fodder.

A.

Treatments in 1932.

Crop.	With Compost.	Without Compost.	P.	Significant difference.
Toria (1932)	702	561	<0.05	88.3

Compost was applied at a rate equivalent in nitrogen content to that supplied by green manures.

B.

Treatments in 1932.

Crop.	Fallow.	Green manure.		P.	Significant difference.
		Guara.	*Sann.*		
Toria (1932) ..	940	534	504	<0.05	110.6
Cotton (1933) ..	742	893	959	0.01	143.5

C.

Treatments in 1932.

Crop.	Green manure.		P.	Significant difference.
	Ploughed in	Cut and removed		
Cotton (1933) ..	1066	850	<0.01	143.5
Maize and Cowpea mixed	5.57 tons.	4.71 tons.	<0.01	0.75 tons.
Til	218	170	<0.01	45.0

D.

Treatments in 1934.

Crop.	Fallow.	*Guara.*		P.	Significant difference.
		2 months after sowing.	At flowering		
Toria (1934-35) ..	1,361	1,107	1,099	<0.05	205.0
Wheat (1934-35) ..	1,788	1,943	1,984		

E.

Treatments in 1934—Cotton in 1935-36.

Crop.	Fallow.		*Guara* ploughed in 2 months after sowing.		*Guara* ploughed in at flowering stage.	
	*Compost.	No Com-post.	*Compost.	No Com-post.	*Compost.	No Com-post.
Cotton	306	281	327	341	408	338

All factors and interactions are non-significant.
*Compost at 20 carts per acre.

F.

1934-35.

Variety and treatment.	Control.	Castor cake at 1,000 lbs. per acre.	Nicifos 22/18 at 170 lbs. per acre.
Mollisoni.			
Heavy irrigation, May sowing—			
Plant spacing 6″	673	794	1,057
,, ,, 12″	666	782	1,089
Moderate irrigation—			
Plant spacing 12″	746	1,031	679
P. 289 F.			
Heavy irrigation, May sowing—			
Plant spacing 6″	724	1,153	1,140
,, ,, 12″	782	1,102	955

Note.—Green manurial treatment was given before the *toria* or wheat crops; other crops followed without repetition of the treatments.

It is quite clear that compost under local conditions benefited only the crop immediately following (*toria*, 1932). Green manure is distinctly harmful when ploughed in for a crop (*toria*) sown in October but is distinctly beneficial when it is sown in November (wheat).

Compost shows no residual effects, while those of green manure can be seen for three succeeding crops—cotton, a mixed fodder crop of maize and cowpea and *til*. The residual effect, however, is obliterated when the yields of the cotton crop are abnormally low. It makes very little difference whether the green manure is ploughed in two months after sowing or at flowering. The difference between these two periods was, however, very small (10 days). Ploughing in the green manure seems to be better than simply growing, harvesting and removing it.

The scope for the use of artificial manures seems to be even greater, but the conditions optimum for their utilization still require careful determination.

(*b*) *Soil erosion.*—Several plants of different habits of growth have now shown themselves capable of regenerating every year, either vegetatively or from fallen seed, when grown without irrigation on the black cotton soil of Indore. In addition, there are some with an evergreen habit. Attempts are now being made to discover the best method of using them to form root-bound bunds along field contours as checks to sheet-erosion by heavy rains. Most of the crops have a good feeding value. The following table includes the most promising varieties :—

TABLE 57. *Plants likely to be useful for erosion control.*

Name.	Habit.	Mode of regeneration.
Grasses.		
Paspalum dilatatum	Stools, short.	Vegetative & seed.
Kikuyu grass	Creeping	,, ,,
Sudan grass	Stools, erect, medium height.	,, ,,
Guinea grass	Stools, tall.	,, ,,
Reana luxurians	,, ,,	,, ,,
Wimmera Rye grass	Stools, short.	,, ,,
Khavi grass	,, ,,	,, ,,
Other plants—		
Chicory	Dwarf, erect.	Seed.
Kollingi	Dwarf, spreading.	,,
Tephrosia Candida and Vogelii	Tall.	,,
Tur (*Cajanus indicus*)	Tall, branching.	,,

(*c*) *Crop rotations.* An experiment comparing five rotations was started in 1933. They were :—

Year.	Rotation.				
	1	2	3	4	5
First ..	Wheat	Cowpeas followed by wheat.	Cowpeas followed by wheat.	Groundnut.	Groundnut.
Second ..	*Jowar*	Groundnut.	*Jowar*.	*Jowar*.	Cowpeas followed by wheat.
Third ..	*Tur*.	*Jowar* with *tur*.	Groundnut.	Cowpeas followed by wheat.	*Jowar*.
Fourth ..	Cotton.	Cotton.	Cotton.	Cotton.	Cotton.

The experiment has run for three years; the results with cotton are given below.

TABLE 58.

The Influence of previous crops on cotton at Indore.

1933—35.

Yield of *kapas* lbs. per acre.

Year.	Previous Crops.			P.	Sig. diff.
	Tur.	Groundnut.	Cowpeas Wheat.		
1934 ..	177	197	153	> 0.05	..
	Jowar and *tur.*		*Jowar.*		
1933 ..	215		331	<0.05	100
1935 ..	325		333		

In 1934 cotton yields did not vary significantly whether the previous crop was *tur*, groundnut or cowpeas followed by wheat. This was a very wet year and it is not yet certain if similar results will be obtained in a normal season, because in the year 1935 of moderate rainfall, though the yields of cotton after *jowar* showed no increase, they were significantly higher after *jowar* and *tur* than in the wet year 1933. This means that in a wet year cotton yields may be depressed if the previous crop is *jowar* with *tur*.

Other crops.—The yield of dry groundnuts following cowpeas and wheat, and those of wheat grain following groundnut in the previous year and a catch-*kharif* crop of cowpeas are given below :—

TABLE 59.

Yields of groundnuts and wheat grain.

Lbs. per acre.

Indore 1933 and 1935.

Year.	Groundnut.	Wheat.	P.	Sig. diff.
1933 ..	1622	282	<0.05	100
1935 ..	264	379		

Differences in season made no difference in the yield of wheat. The low yields of groundnut in 1935 were due to the damage done by jackals at the ripening stage.

(*d*) *Eradication of Kans.*—The field trials to eradicate *kans* with monsoon covers of green grass or *sann* hemp mentioned last year were completely successful. Besides achieving total eradication of the weed, the subsequent wheat crop on the former weed patches in each field grew better than in the surrounding area, and gave higher yields of a better quality of grain with more straw. The organic matter content of the soil in these patches was found, after the harvest of the crop, to be higher in the first six inches than in the soil from the rest of the field.

TABLE 60.

Influence of biological eradication of weeds on subsequent crop and soil.

	Mean yield. Lbs. per acre.		% Mean composition (On oven-dry basis).					
			Soil organic matter.		Grain.			
	Grain.	Straw.	0-6″	6-15″	Total nitrogen.	Albuminoid nitrogen.	Gluten.	Starch.
Normal fields	427	672	0.67	0.70	1.65	0.82	8.04	49.23
Weed-eradicated patches.	811	908	0.88	0.70	2.07	1.13	11.53	31.79

The method has now been adopted as a routine on the Institute Farm.

(*e*) *Poisoned Baits.—Rat-poison.*—It is well known that rats soon learn to avoid poisoned baits of the usual types; this reduces their utility. After several trials it was found that the inclusion of animal grease and glue in the baits made them irresistible for much longer and they have proved most efficacious. Baits prepared in this way met with a wide demand.

Poisoned-bran bait for white ants and other insects.—The composition of this bait has also been improved. It was found to be very effective at Bharatpur and Bundi where the soil was irrigated after application. Two to three applications at 20 lbs. per acre were found necessary before white ants completely disappeared.

13. COMPOST MANUFACTURE.

Farm refuse.—Rain-watered compost was made on cultivators' fields in Jaipur and Jodhpur. The work was very well organized with the following results.

At Jaipur compost was made at twenty-four places in twenty-one villages distributed all over the State. The raw materials used were *katchra* (village and farm refuse) *kadbi* residues, dung, ashes, *akra* and other weeds. A total of 5,109 cu. ft. of raw materials was used. The yield of finished product was 62 per cent. by volume. Twenty-one cultivators expressed appreciation of the process and of the quality of the compost. Of these six complained of the extra labour of turning, two did not feel the need of such a rapid process (evidently they did not realise the increased output) and one objected to the extra space required compared with that for the usual manure heaps. Three were indifferent.

At Jodhpur, in the Pali district, compost was made at five places. The quantity of raw materials used was 1,410 cu. ft. which yielded 85 per cent. by volume of finished compost. The high percentage of final product appears to be due to the extensive use of pure dung. Every cultivator considered the product superior to his usual half-rotted manure. The cultivators applied the compost to wheat fields. One of them reported increased yields. It was also used by one cultivator as a top-dressing for lucerne. Some of them preserved it for the *kharif* crops of 1936.

14. Publications.

The following papers have been submitted for publication within the period of this Report :—

"An analysis of the efficiency of selection methods used in the improvement of Malvi cotton" by J. B. Hutchinson and Kubersingh.

"Genetic principles and the problem of cross-breeding for milk yield in Indian cattle" by J. B. Hutchinson and N. R. Joshi.

"An examination of R. D. Bose's analysis of a serial experiment" by J. B. Hutchinson and V. G. Panse.

"The introduction of improved strains of crop plants in Central India and Rajputana" by J. B. Hutchinson and V. G. Panse.

Papers were read before the bodies named; those marked with an asterisk have also been submitted for publication.

At the Symposium on "Disease Resistance in Plants" held at Coimbatore in October 1935, under the joint auspices of the Indian Academy of Sciences, the Association of Economic Biologists and the Society of Biological Chemists :—

"*Studies in Disease Resistance, I. Cotton Wilt and Environment. " By K. N. Ambegaonkar and Yeshwant D. Wad.

"*Studies in Disease Resistance, II. Leaf-roll and Red-leaf of American Cottons." By I. Madhusudan Rao and Yeshwant D. Wad.

Before the Agricultural Section of the Indian Science Congress during its 23rd Session at Indore in January 1936 :—

1.	Optimum number of buds for sugarcane setts	G. C. Tambe and S. C. Talesara.
2.	Biological eradication of *kans*	G. C. Tambe and Y. D. Wad.
3.	*Manuring of cotton for yield in Malwa..	C. K. Chhaya and P. M. Kulkarni.
4.	Importance of complex designs in agronomical experiments.	S. Shamsher Singh and P. M. Kulkarni.
5.	Treatment of sugarcane setts to improve germination and yield. *Combined with No. 1.	G. C. Tambe and S. C. Talesara.
6.	The use of Revenue Settlement Records for agricultural workers.	K. A. Singh, L. Swaroop and R. K. Aurangabadkar.
7.	Humus supply to irrigated arid soils	S. Shamsher Singh and P. M. Kulkarni.
8.	Preparatory cultivation for wheat in Malwa	G. C. Tambe, S. C. Talesara and L. Swaroop.
9.	Cold weather cultivation of vacant fields and interculture of standing crops in Malwa.	G. C. Tambe and S. C. Talesara.
10.	Comparative study of regional soils	L. N. Desai and S. C. Chakrabarty.
11.	*Root studies—their scope in Agronomy, I.	N. S. Apte.
12.	*Root studies—their scope in Agronomy, II	K. M. Simlote and R. K. Aurangabadkar.
13.	Influence of soil-moisture relationship on crop growth..	I. M. Rao, R. K. Aurangabadkar and B. Goswami.
14.	Groundnut, an investigation into its cultivation in Malwa	G. C. Tambe and S. C. Talesara.
15.	*Cotton yields as affected by soil condition and nutrients.	S. B. Megre and G. T. Shahane.

16.	*Efficient production of tobacco seed	S. B. Mogre and V. N. Bhargave.
17.	The relation between light and other factors in plant development.	I. M. Rao and S. Ghosh.
18.	The influence of treatment and the cotton crop on the soil profile.	S. C. Chakrabarty and L. N. Desai.
19.	Cambodia cotton in Jaipur	Tarachand Kala and G. K. Sant.
20.	Soil texture, nutrition and staple length of cotton ..	S. B. Mogre and Y. D. Wad.
21.	*Bajra* and *Tur* in Jaipur State	K. R. Joshi, T. Kala and P. M. Kulkarni.
22.	Tobacco curing for bright leaf—simple adjustments ..	S. B. Mogre and G. T. Shahane.
23.	Sugar-beet—a possible cash crop for Central India and Rajputana.	I. M. Rao and S. Ghosh.
24.	*Seed quality and crop vigour	R. K. Aurangabadkar and B. Goswami.
25.	*Cultivation of high quality paddy in unpuddled black cotton soils.	C. L. Nagar, T. Krishnamoorthi and P. M. Kulkarni.
26.	Sugarcane x sorghum crosses in Malwa and Rajputana.	G. C. Tambe, S. C. Chakrabarty and V. R. Sathe.
27.	The possibility of the Soyabean crop in Central India. .	R. K. Aurangabadkar and B. Goswami.
28.	Initial start to cotton seedlings with differing soils and nutrition.	I. M. Rao and C. L. Nagar.

Before the Medical and Veterinary Section during the same session :—

(1) 'The utilization of antiseptics and coagulants in composting habitation wastes" by M. A. Nicholson and S. C. Chakrabarty.

(2) "The Indore process for disposing of habitation wastes at Alwar" by C. L. Nagar.

A joint discussion between the Agriculture and the Medical and Veterinary Sections of the Science Congress on "The making of humus from agricultural and habitation wastes and its application," was opened by the Director of the Institute.

A letter to the Editor of *Nature* on the position of agricultural composts relative to that of inorganic fertilizers was published over the names of F. K. Jackson and Y. D. Wad.

The following Bulletins and Leaflets have been published or reprinted :—

Bulletin No. 1.—"The sanitary disposal and agricultural utilization of habitation wastes by the Indore process" by F. K. Jackson and Y. D. Wad (reprinted with additional matter).

Bulletin No. 2.—"The supply of humus to soils" by F. K. Jackson, Y. D. Wad and V. G. Panse (reprinted and revised.)

Bulletin No. 4.—"Studies in the technique of field experiments" by J. B. Hutchinson and V. G. Panse.

Leaflet No. 12.—"Eradication of Kans" (English).

Leaflet No. 13.—"The Indore method of sugarcane cultivation" (English).

Leaflet No. 14.—"Silage making from gr ss in p'ts in dry regions" (English).

THE WORKING OF THE FARM.

15. Fields Trials.

The following experiments were conducted :—

Humus Supply—Incorporation of organic matter in the soil. Green manure with weed eradication. Improvement of water-logged soils.

Soil Improvements—Control of soil erosion by contour-strips-sowing and the use of arrester crops. Effect, on the succeeding crop, of cultivation of land in winter at different depths by different implements. Tests on the efficiency of different implements of interculture. Seedling vigour and yield of cotton.

Rotation.—Rotation of crops. Influence of previous crop on cotton.

Associated growth of crops.—Association of paddy varieties with cotton, groundnut and *tur*.

Weed eradication.—Eradication of weeds by biological means.

Treatment of seed.—Treatment of sugarcane setts with lime-water before planting.

Multiplication of seed.—Paddy, 34 Varieties. Soyabeans, 10 varieties. Peas, 4 varieties. Kikuyu grass. Onions, 2 varieties. Banana, 4 varieties. *Reana luxurians*. Sorghum-sugar-cane hybrids, 6 crosses. Co. canes, 14 varieties.

Sugarcane—Pre-treatment of cane setts. Germination of cane setts with varying number of eye-buds. Cross-wise planting of setts and stubble planting. June and October planting of canes. Association of varieties. Rotation of varieties. Response of cane varieties to top dressing with different organic manures. Sugarcane, manuring of. Preservation of canes by windrowing. Effect on growth and development of regulating the numbers of tillers. Ratooning of varieties, first year.

Lucerne.—Line-sowing of lucerne with reduced irrigation. Lucerne, manurial.

Sugar-beet.—Comparison of the yields of local fodder carrots and sugar-beets.

Mangolds—Small-growth trials, 10 varieties.

Tobacco.—Bulk cropping of cigarette, *jarda*, wrapper and *hukka* varieties.

Compost.—Preparation of bone-char—fixing the technique. Composting of cane trash—further trials. Composting of cow-dung alone—further trials.

16. Crops and Yields.

	Yield in maunds per acre.	
	Maximum.	Minimum.
Cotton, Malvi 9	6.0	0.75
Groundnut, Akola 10	16.22	3.40
Jowar, Ramkel	13.95	10.30
Paddy-drilled and unirrigated	4.90	..
Tur	13.1	10.75
Gram	10.0	0.60
Linseed	7.20	1.67
Wheat, Malvi	9.35	2.50

Sugarcane Varietal, Field 38 H.	Ratoon 1935-36.	Plant-cane 1934-35.
Variety S. 48	592	319
Co. 281	670	445
Co. 213	702	465
Co. 210	712	535
Co. 290	760	610

Sugar-cane Sorghum hybrids, Field 38 K.	
Co. 351	716
Co. 352	625
Co. 353	605
Co. 355	686
Co. 356	464
Co. 357	564

Sugarcane manurial, F. 32.	Range of yield in mds. per acre.
Co. 281	563 to 673
Co. 210	616 to 782
Co. 213	988 to 1,270
Co. 290	1,008 to 1,210

Sugarcane-setts.	Untreated.	Treated with lime.
Co. 290	717	1,042

Sugarcane yield for whole area of F. 32 (1-4 acre).	Number of canes per acre.	Yields in mds. per acre.
Irrespective of treatments	31,800	1,224

Lucerne.—Agronomical experiments on lucerne in previous years did not bring out any significant difference between the flat bed, narrow-ridge and broad ridge system of cultivation. In the year under report a modification was introduced in that the beds were large (75′×35′) and the seed was sown in lines with an ordinary two-coultered *desi* drill. This ensured a saving (1) in the amount of seed, (2) in the number of irrigations and (3) expense on weeding, as interculture by bullocks was possible.

The yields are as follows :—

		lbs. per acre.
1935-36	Winter	13,424
	Summer	12,278
	Monsoon	11,727
	Total ..	37,429

17. General.

(*a*) *Live Stock.*—There are now 13 pairs of bullocks among which two Kankreji pairs only survive of the original 1925 purchases, the remainder having been bought in the last two years. These are of Malvi breed and of average size as usually found with cultivators.

439 cartloads of compost were prepared from the available farm wastes and 30 cartloads of night-soil compost from the residential block.

230 mds. of silage was made from grass.

(*b*) *Workshop.*—The mechanical staff were kept busy in repairing and maintaining the general upkeep of the machinery, fencing, building, roads, etc.

(*c*) The calculated gross returns from the Farm amount to Rs. 6,500, a marked improvement on those of recent years when crop yields were lowered by adverse seasons.

(*d*) *Training of students and help to cultivators.*—Instruction was given in practical agriculture to students from the following places, the periods ranging from a year to a few days :—

Holkar State.
Sikar Illaqa.
Ajmer-Merwara.
Khandwa (Department of Agriculture, C. P. and Municipality).
Mysore.
Chhatarpur State.
Bundi State.

Batches of village teachers from the Bijalpur Normal School, Students from the Union Theological Seminary and also parties of Kumars of the Daly College, Indore, were given lectures or demonstrations according to seasonal operations.

Trained ploughmen and fieldmen were frequently sent out for demonstration work and help in special agricultural matters.

PROPAGANDA AND EXTENSION WORK IN STATES.

18. Visit to States.

During the year under report the Agricultural Adviser made fifteen visits to the States, the Extension Officer sixteen, the Geneticist and Botanist two, the Chemist and Agronomist six and other staff thirty-two.

19. Instruction and Training Facilities.

No fixed courses are provided but practical training is given at the request of the Darbars to members of their Revenue and Agricultural staffs and selected cultivators, the programme of instruction being varied in its items to suit individual cases. No fees are charged and free accommodation is usually provided in the Institute's Visitors' quarters.

Training both in composting farm refuse and habitation wastes was given to Agricultural and Sanitary Officials and sweepers from member-States and outside, the latter process with the aid of the Indore Residency Area Authorities.

Lectures and demonstrations were given by the Extension Officer in district tours to large village audiences. He explained the advantages of growing good crop varieties; of increasing their manure supply by making rain-watered compost from farm wastes; of making grass, *jowar* and *bajra* silage for their cattle, either in pits or in mud-walled silo towers, to suit the local conditions; of the practical possibility of improving their cattle by castrating "scrub" bulls; the lower cost of making better quality *gur* by the McGlashan furnace and a variety of other improvements within the capacity of ordinary cultivators.

Ploughmen trained in building the McGlashan furnace and in *gur* making were placed at the disposal of the Darbars.

Assistance was also given by the Extension Officer in organizing demonstrations at Agricultural shows and cattle fairs in many of the States. Illustrative exhibits were provided, lectures delivered and cinematograph films shown of agricultural and rural uplift subjects accompanied by running commentaries.

Acknowledgment is due to the Indian Central Cotton Committee and the Central Publicity Officer, Railway Board, for the free loan of films. Four films produced by the Institute are now ready for display and others are in preparation.

F. K. JACKSON,
Director.

18*th July* 1936.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Programme of Research Work for 1936-37.

Genetics and Botany Section.

Cotton.

(1) *Botanical Survey.*—Further work in the light of
- (*a*) information collected from old records,
- (*b*) collection of medium staple cottons from short staple areas,
- (*c*) the request of the Indian Central Cotton Committee for an investigation into the possibilities of improving Dholleras cotton.

(2) *Genetics.*—Study of inheritance of major factors in Asiatic and Indian American cottons.

Study of cases of abnormal inheritance of major factors.

Study of the inheritance of quantitative characters.

Study of interspecific hybrids with special reference to the bearing of heterosis on plant breeding procedure.

Study of the rate of mutation in mutable strains.

(3) *Cytology.*—Study of sterile types derived from an interspecific hybrid (G. arboreum G. herbaceum).

Study of chromosome behaviour in F1, F2 and backcrosses of G. anomalum x cultivated Asiatic cottons.

(4) *Physiology.*—Study of cotton hair characteristics.
Development of tests for lint quality suitable for the needs of the plant breeder.
Study of relative selection values of four simple genotypes in Malwa and Nimar.

(5) *Selection and Breeding* :—Propagation and distribution of Malvi 9.
Study of variance in Malvi 1, Malvi 9, and the crosses between them, and re-selection for further propagation according to the results obtained.
Study of and re-selection in progeny rows of 1933 selections.
Study of problems of transference of herbaceum quality to Malvi type.
Study of Cambodia selections grown at Badnawar.
Study of selections in Nimar *desi* made in 1933 and grown in 1934 at Dhamnod.

(6) *Variety Trials.*—Variety trials will be laid down at the Institute and in the territory of member-States as found necessary in the light of results obtained from current trials.

(7) *Statistics.*—The investigations in progress into statistical problems involved in field testing, strain testing where very small quantities of seed are available, and in the examination of segregating progenies, will be continued. Statistical methods for use in the study of quantitative inheritance will be developed with special reference to Pearson and Newman's L tests.

Other Crops.

Work on other crops will be largely confined to the selection and purification of desirable high yielding strains for the main areas served by the Institute, and fundamental research will usually be restricted to cotton. Exceptions from this rule will occur from time to time when opportunities arise of solving general problems more easily than could be done on cotton, and plant breeding material will, of course, be used to the fullest possible extent to provide data of scientific value.

(1) *Botanical.*—Comparative developmental study of durum and bread wheats.
(2) *Genetics.*—Study of inheritance of certain characters in local durum wheats.
(3) *Selection and Breeding.*—Selection and breeding work will be continued on the following crops :—

Kharif.	*Rabi.*
Jowar.	Wheat.
Bajra.	Barley.
Tur.	Gram.
Tilli.	Linseed.
Niger.	Kesari.
Groundnut.	Safflower.

A part at least of the breeding material in these crops will be grown on the farms of member-States.

(4) *Variety Trials.*—Variety trials on all crops of interest to member-States will be laid down in the light of information gained from the current season's experiments.

(5) *Lathyrism.*—Work on *Kesari* is being continued and in connection with it, the botanical and agricultural problems involved in the growth of the associated weeds responsible for lathyrism are being studied.

APPENDIX V.

THE BOMBAY COTTON CONTROL ACT, 1935.

AN Act to provide for the prohibition of the cultivation of Goghari cotton and the mixing of such cotton with other cotton and for the prohibition or restriction of the possession or use of, or trade in, Goghari cotton or cotton mixed with Goghari cotton.

WHEREAS it is expedient in the best interests of the growers of cotton in certain areas in the Presidency of Bombay, the cotton trade and the economic prosperity of the said Presidency to maintain the quality and reputation of the cotton grown in those areas and for that purpose to prohibit the cultivation of Goghari cotton and the mixing of such cotton with other cotton and to prohibit or restrict the possession or use of, or trade in, Goghari cotton or cotton mixed with Goghari cotton ;

And whereas the previous sanction of the Governor General required by sub-section (3) of section 80A of the Government of India Act and the previous sanction of the Governor required by section 80C of the said Act have been obtained for the passing of this Act ; It is hereby enacted as follows :— 5 and 6 Geo. V, C. 61.

1. *Short title and extent.*—(1) This Act may be called the Bombay Cotton Contro Act, 1935.

(2) It extends to the whole of the Presidency of Bombay.

2. *Definitions.*—In this Act, unless there is anything repugnant in the subject or context,—

(*a*) "Cotton" includes cotton plant, ginned and unginned cotton, cotton waste and cotton seed ;

(*b*) "Director of Agriculture" means the officer appointed for the time being to be the Director of Agriculture ;

(*c*) "Goghari cotton" means the kind of cotton known as *Gossypium herbaceum (Variety Goghari)* ; and

(*d*) "Controlled area" means an area specifiedi n a notification under section 3.

3. *Power to issue notification prohibiting the cultivation, etc., of Goghari cotton.*—The Local Government may, by notification in the *Bombay Government Gazette*, in such local area and for such period as may be specified in the notification—

(*a*) prohibit the cultivation of Goghari cotton ; or

(*b*) prohibit the mixing of Goghari cotton with any other cotton ; or

(*c*) prohibit or restrict the possession or use of, or trade in, Goghari cotton or any other cotton mixed with Goghari cotton.

4. *Penalty.*—Any person, who, knowingly in contravention of the provisions of this Act or of any notification issued under section 3 or rule made under section 14—

(*a*) cultivates Goghari cotton shall, on conviction, be punishable with fine which may extend to rupees twenty for the first offence and to rupees fifty for every subsequent offence ;

(*b*) (*i*) mixes or causes to be mixed Goghari cotton with any other cotton, or

(*ii*) possesses, uses or trades in Goghari cotton or any other cotton mixed with Goghari cotton,

shall, on conviction, be punishable with fine which may extend to rupees five hundred for the first offence and to rupees one thousand for every subsequent offence.

5. *Confiscation.*—Whenever an offence under this Act has been committed, all cotton in respect of which the offence has been committed and every box, receptacle, package or covering in which such cotton is contained shall be liable to confiscation.

6. *Procedure in confiscation.*—(1) When in any case tried by a Criminal Court, the Court decides that anything is liable to confiscation under section 5, he may, after hearing the person, if any, claiming any right thereto and the evidence, if any, which he produces in support of his claim, order confiscation.

(2) When an offence under this Act has been committed and the offender is not known or cannot be found or when anything liable to confiscation under this Act is found and is not claimed by any person, the officer authorised by the Local Government in this behalf may hold an inquiry and may order confiscation :

Provided that no such order shall be made before the expiration of one month from the date of seizing the thing liable to confiscation or without hearing the person, if any, claiming any right thereto and the evidence, if any, which he produces in support of his claim.

7. *Compounding.*—(1) The officer authorised under sub-section (2) of section 6 may accept from any person who is reasonably suspected of having committed an offence under section 4, a sum of money as may be prescribed by rules made under section 14 by way of composition for such offence.

(2) On payment of such sum, such person, if in custody, shall be set at liberty and if proceedings in any criminal court have been instituted against such person in respect of such offence, the composition shall be deemed to amount to an acquittal and no further proceedings shall be taken against such person in respect of such offence.

(3) Notwithstanding anything contained in sub-section (2), it shall be lawful for the court or the officer authorized under sub-section (2) of section 6 to order confiscation of anything liable to confiscation uner section 5.

8. *Power of entry and seizure.*—(1) Any officer authorised in this behalf by the Local Government may between the hours of 6 a.m. and 6 p.m.—

(*a*) enter upon any land in a controlled area in which he knows or has reason to believe that Goghari cotton has been or is being cultivated in contravention of a notification under section 3, uproot or cause to be uprooted such cotton, and seize the cotton so uprooted ; or

(*b*) enter upon or into any land, building, ship, vessel, vehicle or place in a controlled area in which he knows or has reason to believe that Goghari cotton or any other cotton mixed with Goghari cotton is kept in contravention of a notification under section 3, and seize such cotton.

(2) Every officer seizing any cotton under this section shall forthwith—

(*a*) make a report of such seizure to the nearest Magistrate of the First or Second Class having jurisdiction to try the offence committed in respect of such cotton, specifying in such report the particulars of such cotton, and furnish a copy of such particulars to the occupier, or person in charge of the land, building, ship, vessel, vehicle or place on or in which such seizure was made, and

(*b*) subject to rules made under section 14, forward such cotton to the nearest officer authorised by the Local Government to receive it, for examination and for report to the Director of Agriculture.

(3) The opinion of the officer authorised under sub-section (2) regarding such cotton recorded in any document signed by such officer shall be evidence as to the nature of such cotton in any inquiry, trial or proceeding under this Act.

9. *Duty of owner, occupier and person in charge to give facilities for inspection by authorised officer.*—(1) Every owner, occupier or person in charge, of any land, building, ship, vessel, vehicle or place shall give all reasonable facilities to the officer, authorised under sub-section (1) of section 8, to inspect such land, building, ship, vessel, vehicle or place.

(2) Any person who contravenes the provisions of sub-section (1), shall, on conviction, be punishable with fine which may extend to rupees twenty.

10. *Previous sanction and limitation for prosecution.*—No prosecution under this Act shall be instituted without the previous sanction of the Director of Agriculture.

11. *Cognizance of offences.*—No criminal court inferior to that of a Presidency Magistrate or a Magistrate of the Second Class shall try any offence under this Act.

12. *Protection for acts done under the Act.*—No suit, prosecution or other legal proceeding shall be instituted against any person for anything which is in good faith done or intended to be done under this Act.

13. *Officer acting under the Act to be public servant.*—Every officer acting or purporting to act in pursuance of the provisions of this Act shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code. XLV of 1860.

14. *Rules.*—(1) The Local Government may make rules not inconsistent with the provisions of this Act for the purpose of carrying into effect the purposes of this Act.

(2) In particular and without prejudice to the generality of the foregoing provision, the Local Government may make rules for all or any of the following purposes, namely:—

(*a*) to prescribe the sum of money to be paid by way of composition under section 7;

(*b*) to prescribe the conditions subject to which cotton seized may be forwarded under section 8;

(*c*) any other matter which is to be or may be prescribed.

(3) Any such rule may provide that a contravention thereof shall be punishable with fine which may extend to rupees fifty.

(4) The rules made under this section shall be subject to the condition of previous publication in the *Bombay Government Gazette.*

(5) Rules made under this section shall be laid upon the table of the Bombay Legislative Council at the session of the said Council next following and shall be liable to be modified or rescinded by a resolution of the said Council and such rule shall after notification of such resolution in the *Bombay Government Gazette* be deemed to have been modified or rescinded accordingly:

Provided that when in the opinion of the Governor in Council such modification or rescission is likely to defeat or frustrate any of the purposes of this Act, the Governor in Council may by notification in the *Bombay Government Gazette* declare that the modification or rescission shall have no effect and thereupon the rules shall remain in force as if they had not been modified or rescinded.

APPENDIX VI.

BOMBAY ACT No. IV OF 1936.

(First published, after having received the assent of the Governor-General, in the "Bombay Government Gazette" on the 16th March 1936.)

An Act to amend the Cotton Ginning and Pressing Factories Act, 1925, in its application to the Presidency of Bombay.

WHEREAS it is expedient to amend the Cotton Ginning and Pressing Factories Act, 1925, in its application to the Presidency of Bombay for the purposes hereinafter appearing; And whereas the previous sanction of the Governor-General required under sub-section (3) of section 80A and the previous sanction of the Governor required under section 80C of the Government of India Act have been obtained for the passing of this Act; It is hereby enacted as follows:—

1. *Short title, extent and commencement.*—(1) This Act may be called the Cotton Ginning and Pressing Factories (Bombay Amendment) Act, 1936.

(2) This Act shall extend in the first instance to the Province of Sind or such area in the said Province with effect from such date as the Local Government may by notification in the local official *Gazette* appoint. The Local Government may by notification in the local official *Gazette* extend the provisions of this Act to any other area with effect from such date as the Local Government may appoint in the said notification.

2. *Amendment of section 2 of Act XII of* 1925.—In section 2 of the Cotton Ginning and Pressing Factories Act, 1925, hereinafter called the said Act,—

(1) after the word, comma and dash "context,—" the following shall be inserted, namely:—

"(*aa*) 'admixture of cotton' means a prescribed mixture of different varieties of cotton;" and

(2) after clause (*f*) the following clause shall be inserted, namely:—

"(*ff*) 'licence' means a licence granted under section 2A."

(3) after clause (*h*) the following clause shall be inserted, namely:—

"(*i*) 'Season' means such period as may from time to time be prescribed."

3. *Insertion of section 2A in Act XII of* 1925.—After section 2 of the said Act, the following section shall be inserted, namely:—

"2A. *Licence for working cotton ginning factory or cotton pressing factory.*—(1) No cotton ginning factory or cotton pressing factory shall be worked without a licence granted to the owner thereof by such authority, in such form, subject to such conditions and on payment of such fee, as may be prescribed.

(2) (*a*) A licence for which the prescribed fee has been paid shall be liable to be refused only on the ground that the owner or person in charge of a cotton ginning or cotton pressing factory in respect of which a licence is applied for has been convicted of an offence punishable under this Act,

(*b*) A licence shall be liable to be suspended, withdrawn or cancelled only on the ground that the owner or person in charge of the cotton ginning or cotton pressing factory in respect of which a licence was granted has been convicted of an offence punishable under this Act :

Provided that no licence shall be suspended, withdrawn or cancelled under this clause until after the expiration of the season in which the said owner or person has been so convicted.

(3) If any person works a cotton ginning or cotton pressing factory in respect of which a licence has not been granted or has been suspended, withdrawn or cancelled, such person shall be punishable :—

(*a*) on a first conviction, with fine which may extend to five hundred rupees and, if the offence has continued for more than one day, with an additional fine which may extend to one hundred rupees for every day subsequent to the first day during which the offence has continued ; and

(*b*) on every subsequent conviction, with fine which may extend to fifteen hundred rupees and, if the offence has continued for more than one day, with an additional fine which may extend to two hundred rupees for every day subsequent to the first day during which the offence has continued."

4. *Amendment of section* 3 *of Act XII of* 1925.—In sub-section (2) of section 3 of the said Act :—

(1) the word ' and ' shall be omitted, and

(2) the following words shall be added at the end :—

" and the prescribed particulars as supplied by such person of the cotton ginning factory where it has been ginned."

5. *Insertion of new sections* 3*A*, 3*B and* 3*C in Act XII of* 1925.—After section 3 of the said Act, the following new sections shall be inserted, namely :—

" 3A. *Prohibition against watering, etc., of cotton.*—(1) The Local Government may by notification in the local official *Gazette* declare that in any area specified in such notification and to which this Act has been extended, no cotton which is ginned or pressed in a cotton ginning or cotton pressing factory shall contain any mixture of cotton.

(2) Any owner of a cotton ginning or cotton pressing factory or any person in charge of such factory—

(*a*) who knowing or having reason to believe that any cotton is watered or contains seed in excess of the prescribed proportion or contains any foreign substance, gins or presses or allows such cotton to be ginned or pressed in such factory, or

(*b*) who in any area specified in the notification under sub-section (1) gins or presses or allows to be ginned or pressed any cotton which he knows or has reason to believe to contain an admixture of cotton,

shall, on conviction, be punishable with fine which may extend to five thousand rupees.

(3) Any owner of cotton who knowingly waters any cotton which is ginned and which is being, or is intended to be, pressed in a cotton pressing factory, or mixes seed or foreign substance with such cotton, or in any area specified in

sub-section (1) makes any admixture of cotton, or abets or knowingly allows or connives at any such watering, mixing or admixture of cotton, shall, on conviction, be punishable with fine which may extend to five thousand rupees.

Explanation.—For the purposes of this section, cotton shall not be deemed to be watered, unless such cotton contains moisture in excess of the normal quantity. The normal quantity of moisture in any given quantity of cotton is the amount of moisture that such cotton is reasonably expected to have, regard being had to the place or places at or to which, and the time or times of the year in which, such cotton has been picked, collected, stored, conveyed, left, ginned or pressed. A certificate given by the prescribed authority as to the normal quantity of moisture that a given quantity of such cotton should have and the quantity of moisture that it possesses shall be evidence of such matters, until the contrary is proved; and if the latter quantity exceeds the former it shall be evidence, until the contrary is proved, that the cotton is watered.

3B. *Examination of cotton, packages or bales.*—(1) The Local Government or any gazetted officer authorised by it in this behalf may on its or his own motion or on receipt of a complaint that there has been a contravention of the provisions of section 3A in respect of any cotton, package or of any bale and in the case of a complaint, on payment of the prescribed fee by the complainant, cause such cotton or the contents of such package or bale to be examined by the prescribed person or body.

(2) A certificate given by such person after examination of the contents of any bale under sub-section (1) shall be admissible in evidence and be presumptive proof of the facts mentioned therein until the contrary is proved.

3C. *Entry and inspection.*—(1) The Local Government may authorise any gazetted officer to enter into and inspect, at any reasonable time, any cotton ginning or cotton pressing factory for the purpose of ascertaining whether there is any contravention therein of any of the provisions of this Act or of any rule made thereunder or of any of the conditions subject to which a licence has been granted in respect of such factory and to seize all things in respect of which an offence punishable under this Act appears to have been committed.

(2) The owner or the person in charge of every cotton ginning or cotton pressing factory shall give every reasonable assistance to the inspecting officer in the performance of his duties under sub-section (1).

(3) The owner or the person in charge of such factory shall, in every instance, be permitted to attend during the inspection and the things seized during such inspection shall be sealed in the prescribed manner."

6. *Amendment of section 5 of Act XII of 1925.*—For section 5 of the said Act, the following section shall be substituted, namely :—

" 5. *Returns.*—(1) The owner of every cotton ginning factory shall submit to the prescribed authority, within such time and in such form, as may be prescribed, monthly returns showing the quantity of cotton ginned in the factory during the preceding month and from the commencement of the season to the end of that month.

2. The Local Government shall compile from the monthly returns submitted under sub-section (1), and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total quantity of cotton ginned in the province during the month and from the commencement of the season to the end of the month to which the returns relate :

Provided that the quantity of cotton ginned in any individual factory shall not be published.

(3) The owner of every cotton pressing factory shall submit to the prescribed authority, within such time and in such form, as may be prescribed, weekly returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of that week, and the approximate average net weight of the bales pressed in that week.

(4) The Local Government shall compile from the weekly returns submitted under sub-section (3), and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total number of bales pressed in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the number of bales pressed in any individual factory shall not be published.

(5) If default is made in submitting any return as required by sub-section (1) or sub-section (3), the owner of the factory shall, on conviction, be punishable with fine which may extend to fifty rupees.

(6) Where the owner of a cotton ginning or cotton pressing factory has notified to the prescribed authority that the work of ginning cotton or pressing bales in that factory has been suspended, it shall not be necessary for the owner to submit returns under sub-section (1) or sub-section (3) until such work has been resumed."

7. *Amendment of section* 6 *of Act XII of* 1925.—In section 6 of the said Act, after the words " other than " the words and figures " the standard weights and measures, weighing and measuring instruments authorised under the Bombay Weights and Measures Act, 1932, in districts or areas in which Parts II, III, V and VI of that Act are in force or elsewhere other than " shall be inserted.

8. *Amendment of section* 7 *of Act XII of* 1925.—In sub-section (1) of section 7 of the said Act, after the words " for the purpose of sections " insert the figures and letters " 3A, 3C."

9. *Insertion of new section* 11*A in Act XII of* 1925.—After section 11 of the said Act the following new section shall be inserted, namely :—

" 11A. *Power of Magistrate to pass sentence.*—Notwithstanding anything contained in section 32 of the Code of Criminal Procedure, 1898, a Presidency Magistrate or a Magistrate of the First Class may pass any sentence provided for any offence punishable under this Act and the provisions of the said Code shall be deemed to have been amended accordingly."

10. *Amendment of section* 13 *of Act XII of* 1925.—(1) In section 13 of the said Act, after clause (*a*), the following clauses shall be inserted, namely :—

" (*aa*) what shall constitute an admixture of cotton ;

(*ab*) the period which shall from time to time constitute a season ;

(*ac*) the authority by whom, the form in which, the conditions subject to which and the fees on payment of which, a licence may be granted under sub-section (1) of section 2-A ;

(*ad*) the particulars of the cotton ginning factory to be entered in the register maintained under sub-section (2) of section 3 ;

(*ae*) the proportion of seed which may be contained in cotton ;

(*af*) the person authorised to give a certificate regarding the quantity of moisture contained in any cotton and other matters specified in section 3-A ;

(*ag*) the person authorised to examine bales under section 3-B ;

(*ah*) the procedure for making a complaint and causing the contents of a bale to be examined and the fee for examination of the contents of a bale under sub-section (1) of section 3-B ;

(*ai*) the manner in which the things seized shall be sealed under section 3-C."

(2) Section 13 of the said Act shall be renumbered as sub-section (1) of that section and after the sub-section so renumbered, the following sub-sections shall be added, namely :—

"(2) The rules to be made under sub-section (1) shall be subject to the condition of previous publication.

(3) Rules made under sub-section (1) shall as soon as they are made be laid upon the table of the Bombay Legislative Council for a period of one month and shall be liable to be modified or rescinded by a resolution tabled at the session thereof immediately following the expiry of the said period ; such rule shall, after notification in the local official *Gazette*, be deemed to have been modified or rescinded accordingly :

Provided that when, in the opinion of the Local Government, such modification or rescission is likely to defeat or frustrate any of the purposes of this Act, the Local Government may, by notification in the local official *Gazette*, declare that the modification or rescission shall have no effect and thereupon the rule shall remain in force as if it had not been modified or rescinded."

11. *Addition of sections* 16 *and* 17 *in Act XII of* 1925.—After section 15 of the said Act, the following sections shall be added, namely :—

" 16. *Penalty.*—Whoever contravenes any of the provisions of this Act or any rule made thereunder or any of the conditions subject to which a licence has been granted to him shall, on conviction, if no other penalty is already provided in this Act for such contravention, be punishable with fine which may extend to five hundred rupees or, if he has previously been convicted of an offence under this Act or any rule made thereunder, with fine which may extend to fifteen hundred rupees.

17. *Compounding offences, etc.*—(1) The District Magistrate may accept from any person whose licence is liable to be suspended, withdrawn or cancelled under this Act, or who is reasonably suspected of having committed an offence under this Act, a sum of money in lieu of such suspension, withdrawal or cancellation or by way of composition for the offence which may have been committed, as the case may be.

(2) On payment by such person of such sum to the District Magistrate, such person if in custody shall be set at liberty and if criminal proceedings shall have been instituted against such person, the composition shall be held to amount to an acquittal."

12. *Amendment of sections* 3, 4, 6, 7, 8 *and* 9 *of Act XII of* 1925.—In sub-sections (5) and (6) of section 3, in sub-section (2) of section 4, in sub-section (2) of section 6, in sub-section (3) of section 7, in sub-section (2) of section 8 and in sub-section (3) of section 9 of the said Act for the words "shall be punished" the words "shall, on conviction, be punishable" shall be substituted.

APPENDIX VII.

As Passed by the Legislative Council.

CENTRAL PROVINCES BILL No. 33 OF 1935.

THE COTTON GINNING AND PRESSING FACTORIES (CENTRAL PROVINCES AMENDMENT) BILL, 1935.

A Bill to amend the Cotton Ginning and Pressing Factories Act, 1925, in its application to the Central Provinces. XII of 1925.

Preamble.—Whereas it is expedient to amend the Cotton Ginning and Pressing Factories Act, 1925, in its application to the Central Provinces, in the manner hereinafter appearing;

And whereas the previous sanction of the Governor-General required under sub-section (3) of section 80-A of the Government of India Act has been obtained to the passing of this Act;

It is hereby enacted as follows:—

1. *Short title and commencement.*—(1) This Act may be called the Cotton Ginning and Pressing Factories (Central Provinces Amendment) Act, 1936.

(2) It shall come into force on such date as the Local Government may, by notification, appoint in this behalf.

1-A. *Amendment of section 2 of Act XII of* 1925.—In section 2 of the Cotton Ginning and Pressing Factories Act, 1925 (hereinafter referred to as the said Act)—

(*i*) after the word, comma and dash "context,—", the following shall be inserted, namely:—

"(*aa*) 'admixture of cotton' means a prescribed mixture of different varieties of cotton";

(*ii*) after clause (*f*), the following clause shall be inserted, namely:—

"(*ff*) 'licence' means a licence granted under section 2-A."

(*iii*) after clause (*h*), the following clause shall be inserted, namely:—

"(*i*) 'season' means such period as may from time to time be prescribed."

2. *Insertion of section 2-A in Act XII of* 1925.—After section 2 of the said Act, the following section shall be inserted, namely:—

"2-A. *Licence for working cotton ginning factory or cotton pressing factory.*—(1) No cotton ginning factory or cotton pressing factory shall be worked without a licence granted to the owner thereof by such authority, in such form, subject to such conditions and on payment of such fee, as may be prescribed.

(2) Whoever contravenes the provision of sub-section (1) shall be punishable with fine which may extend to five hundred rupees or, if he has previously been convicted of an offence under sub-section (1), to fifteen hundred rupees.

(3) No licence for which the prescribed fee has been paid shall be refused, suspended or cancelled except on the ground that the owner or person in charge of the factory concerned has been convicted for the contravention of the provisions of section 3-A."

Provided that no licence shall be suspended or cancelled under this sub-section until after the expiration of the season in which the said owner or person has been so convicted.

2-A. *Amendment of section* 3 *of Act XII of* 1925.—In sub-section (2) of section 3 of the said Act—

(1) the word ' and ' shall be omitted, and

(2) the following words shall be added at the end, namely :—

" and the prescribed particulars as supplied by such person of the cotton ginning factory where it has been ginned."

3. *Insertion of sections* 3-*A*, 3-*B and* 3-*C in Act XII of* 1925.—After section 3 of the said Act, the following sections shall be inserted, namely :—

" 3-A. *Prohibition against watering, etc., of cotton.*—(1) The Local Government may, by notification, declare that in any area specified in such notification, no cotton which is ginned or pressed in a cotton ginning or cotton pressing factory shall contain any admixture of cotton.

(2) Any owner of a cotton ginning factory or any person in charge of such factory who knows or has reason to believe that any cotton ginned in such factory contains seed in excess of the prescribed proportion or contains any foreign substance shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees.

(3) Any owner of a cotton pressing factory or any person in charge of such factory who knowing or having reason to believe that any cotton is watered or contains seed in excess of the prescribed proportion or contains any foreign substance, presses or allows such cotton to be pressed in such factory shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees.

(4) Any owner of a cotton ginning or cotton pressing factory or any person in charge of such factory who in any area specified in the notification under sub-section (1) gins or presses or allows to be ginned or pressed any cotton which he knows or has reason to believe to contain an admixture of cotton shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees.

(5) Any owner of cotton who knowingly waters any cotton which has been ginned and which is being or is intended to be, pressed in a cotton pressing factory, or mixes seed or foreign substance with such cotton, or in any area specified in sub-section (1) makes any admixture of cotton, or abets or knowingly allows or connives at any such watering, mixing or admixture of cotton, shall, on conviction, be punishable with fine which may extend to fifteen hundred rupees.

Explanation.—For the purposes of this section, cotton shall not be deemed to be watered, unless such cotton contains moisture in excess of the normal quantity. The normal quantity of moisture in any given quantity of cotton is the amount of moisture that such cotton is reasonably expected to have, regard being had to the place or places at or to which, and the time or times of the year in which, such cotton has been picked, collected, stored, conveyed, left, ginned or pressed. A certificate given by the prescribed authority as to the normal quantity of moisture that a given quantity of such cotton should have and the quantity of moisture that it possesses shall be evidence of such matters, until the contrary is proved; and if the latter quantity exceeds the former it shall be evidence, until the contrary is proved, that the cotton is watered.

3-B. *Examination of cotton, packages or bales.*—(1) The Local Government or any gazetted officer authorized by it in this behalf may on its or his own motion or on receipt of a complaint that there has been a contravention of the provisions of section 3-A in respect of any cotton, package or of any bale and in the case of a complaint, on payment of the prescribed fee by the complainant, cause such cotton or the contents of such package or bale to be examined by the prescribed person or body.

(2) A certificate given by such person or body after examination of the contents of any bale under sub-section (1) shall be admissible in evidence and be presumptive proof of the facts mentioned therein until the contrary is proved.

3-C. *Entry and inspection.*—(1) The Local Government may authorize any gazetted officer to enter into and inspect, at any reasonable time, any cotton ginning or cotton pressing factory for the purpose of ascertaining whether there is any contravention therein of any of the provisions of this Act or of any rule made thereunder or of any of the conditions subject to which a licence has been granted in respect of such factory and to seize all things in respect of which an offence punishable under this Act appears to have been committed.

(2) The owner or the person in charge of every cotton ginning or cotton pressing factory shall give every reasonable assistance to the inspecting officer in the performance of his duties under sub-section (1).

(3) The owner or the person in charge of such factory shall, in every instance, be permitted to attend during the inspection and the things seized during such inspection shall be sealed in the prescribed manner.

4. *Amendment of section* 5, *Act XII of* 1925.—For section 5 of the said Act, the following section shall be substituted, namely :—

" 5. *Returns.*—(1) The owner of every cotton ginning factory shall submit to the prescribed authority, within such time and in such form, as may be prescribed, weekly returns showing the quantity of cotton ginned in the factory during the preceding week and from the commencement of the season to the end of that week.

(1-A) The Local Government shall compile from the weekly returns submitted under sub-section (1), and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total quantity of cotton ginned in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the quantity of cotton ginned in any individual factory shall not be published.

(2) The owner of every cotton pressing factory shall submit to the prescribed authority, within such time and in such form, as may be prescribed, weekly returns showing the total number of bales of cotton pressed during the preceding week and from the commencement of the season to the end of that week, and the approximate average net weight of the bales pressed in that week.

(3) The Local Government shall compile from the weekly returns submitted under sub-section (2), and shall publish in such manner as the Governor-General in Council may direct, a statement showing the total number of bales pressed in the province during the week and from the commencement of the season to the end of the week to which the returns relate :

Provided that the number of bales pressed in any individual factory shall not be published.

(4) If default is made in submitting any return as required by sub-section (1) or sub-section (2), the owner of the factory shall be punishable with fine which may extend to fifty rupees.

(5) Where the owner of a cotton ginning factory or a cotton pressing factory has notified to the prescribed authority that the work of ginning cotton or pressing bales in that factory has been suspended, it shall not be necessary for the owner to submit returns under sub-section (1) or sub-section (2) until such work has been resumed."

4-A. *Amendment of section* 7 *of Act XII of* 1925.—In sub-section (1) of section 7 of the said Act, after the words "for the purposes of sections" insert the figures and letters "3-A, 3-C."

5. *Amendment of section* 13, *Act XII of* 1925.—In section 13 of the said Act, after clause (*a*), the following clauses shall be inserted, namely :—

"(*aa*) what shall constitute an admixture of cotton ;

(*ab*) the period which shall from time to time constitute a season ;

(*ac*) the authority by whom, the form in which, the conditions subject to which and the fee on payment of which, a licence may be granted under sub-section (1) of section 2-A ;

(*ad*) the particulars of the cotton ginning factory to be entered in the register maintained under sub-section (2) of section 3 ;

(*ae*) the proportion of seed which may be contained in cotton ;

(*af*) the person authorized to give a certificate regarding the quantity of moisture contained in any cotton and other matters specified in section 3-A ;

(*ag*) the person or body authorized to examine bales under section 3-B ;

(*ah*) the procedure for making a complaint and causing the contents of a bale to be examined and the fee for examination of the contents of a bale under sub-section (1) of section 3-B ;

(*ai*) the manner in which the things seized shall be sealed under section 3-C."

5-A. *Amendment of section* 13 *of Act XII of* 1925.—Section 13 of the said Act shall be renumbered as sub-section (1) of that section and after the sub-section so renumbered, the following sub-sections shall be added, namely :—

"(2) The rules to be made under sub-section (1) shall be subject to the condition of previous publication.

(3) A copy of the draft of the proposed rules shall be laid on the table of the Central Provinces Legislative Council. The Local Government shall give the Council an opportunity of discussing them, and shall take into consideration any resolution concerning the same which may be passed by the Legislative Council before finally publishing them in the local official *Gazette*."

5. *Addition of section* 16, *in Act XII of* 1925.—After section 15 of the said Act, the following section shall be added, namely :—

" 16. Whoever contravenes any of the provisions of this Act or any rule made thereunder or any of the conditions subject to which a licence has been granted to him shall, on conviction, if no other penalty is already provided in this Act for such contravention, be punishable with fine which may extend to five hundred rupees, or, if he has previously been convicted of an offence under this Act or any rule made thereunder, with fine which may extend to fifteen hundred rupees."

APPENDIX VIII.

THE UNITED PROVINCES COTTON PEST CONTROL BILL.

A Bill to Provide for the Proper Treatment of Cotton Seed.

Preamble.—Whereas it is expedient to provide for the proper treatment of cotton seed in order to avoid damage to cotton crops by the attacks of the larva of the moth *Platyedra gossypiella* Saund., commonly known as the Pink Boll-worm, and whereas the previous sanction of the Governor-General has been obtained under sub-section (3) of section 80-A of the Government of India Act to the passing of this Act, it is hereby enacted as follows :—

1. *Short title, extent and commencement.*—(1) This Act may be called the Cotton Pest Control Act.

(2) It extends to the whole of the United Provinces of Agra and Oudh.

(3) It shall come into force on such date or dates and in such parts of the United Provinces as the Local Government may by notification in the *Gazette* from time to time direct.

2. *Definitions.*—In this Act, unless there is anything repugnant in the subject or context—

(*a*) " Controlled area " means any part of the United Provinces in which the Act is in force by virtue of a notification issued under sub-section (3) of section 1 ;

(*b*) " Prescribed " means prescribed by or under rules framed under this Act ;

(*c*) " Raw cotton " means the unginned bolls of the cotton plant ;

(*d*) " Seed " means the seed of the cotton plant ;

(*e*) " Hand-ginning " means ginning by means of apparatus operated by human power ;

(*f*) " Treat " with its grammatical variations and cognate expressions means to subject seed to a prescribed process for the purpose of freeing it from infection by a pest.

3. *Ginning of raw cotton.*—In any controlled area every owner of raw cotton whether produced in or imported into that area, shall cause it to be ginned before such date as shall be prescribed, being not later than the sixteenth day of March next following such production or importation :

Provided that a date not later than the first day of April may be prescribed as the latest date by which such raw cotton may be hand-ginned.

4. *Treatment of seed.*—Subject to the provisions of section 8, every owner of seed in any controlled area, whether such seed has been produced in or imported into that area, and every person who has undertaken the ginning of any raw cotton on behalf of another shall before a date which shall be prescribed, being not later than seven days after the prescribed date first referred to in section 3, cause such seed to be treated by such method as shall be prescribed :

Provided that for the purpose of treatment of seed by exposure to the heat of the sun the date prescribed shall be not earlier than the first day of April nor later than the fifteenth day of May.

5. *Prohibition against disposal of untreated seed.*—No person shall sell or otherwise dispose of any seed which has not been treated in the prescribed manner:

Provided that untreated hand-ginned seed may be sold or otherwise disposed of between the 1st day of October in any year and the 15th day of March next following.

6. *Prohibition against sowing of untreated seed.*—No person shall sow or cause to be sown any seed which has not been treated in accordance with the provisions of section 4.

7. *Import of raw cotton into scheduled area.*—No person shall import or cause to be imported any raw cotton into a controlled area between the prescribed date first referred to in section 3 and the fifteenth day of September next following:

Provided that this section shall not apply to raw cotton which is conveyed by railway through the said area in closed waggons and which is not unloaded at any place within the area except for purposes of transhipment in the ordinary course of transit.

8. *Import of seed into controlled area.*—(1) No person shall import or cause to be imported any seed into a controlled area except by railway and in closed waggons and except in accordance with the terms of a licence issued under this Act:

Provided that this sub-section shall not apply to seed conveyed by railway through such area in closed waggons and not unloaded at any place within the area except for the purposes of transhipment in the ordinary course of transit.

(2) Every person importing or causing to be imported any seed into a controlled area in accordance with the provisions of sub-section (1) shall before its arrival within the said area make adequate arrangements for its treatment at a place to be specified in the licence and on its arrival shall forthwith cause it to be conveyed to the said place and there treated in accordance with the provisions of sub-section (3):

Provided that this sub-section shall not apply to any seed so imported into a controlled area from any other controlled area, in respect of which seed it has been certified in the prescribed manner that it has already been treated in such other controlled area.

(3) The treatment provided for by sub-section (2) shall be completed—

(*a*) in the case of any seed imported after the fifteenth day of September in any year and on or before the prescribed date first referred to in section 3—within fourteen days of its arrival at the place specified in the licence, subject to the provision that the treatment shall be completed not later than forty-eight hours after the prescribed date aforesaid, and

(*b*) in the case of any seed imported after the prescribed date aforesaid and not later than the fifteenth day of September next following—within forty-eight hours of its arrival at the place specified in the licence.

9. *Export of raw cotton.*—The Local Government may at any time pass an order prohibiting, during such periods as may be specified therein, the export of raw cotton from any controlled area, except in accordance with the terms of a licence issued under this Act.

10. *Maintenance of registers.*—Every person who undertakes the treatment of seed otherwise than by exposure to the heat of the sun shall maintain such records, register and accounts as may be prescribed.

11. *Appointment and powers of Inspectors.*—(1) The Local Government may appoint such persons as it thinks fit to exercise all or any of the powers and perform all or any of the duties assigned to an inspector by this Act or by rules made thereunder

and may define the local limits within which such powers and duties may be exercised and performed.

(2) An inspector may, subject to such rules as may be made in this behalf :—

(*i*) enter and inspect all places in which any business connected with the ginning or sale of raw cotton or the treatment or sale of seed is carried on ;

(*ii*) examine any machinery installed for the treatment of seed ;

(*iii*) examine any seed (before or after treatment) for the purpose of ascertaining whether it has been effectively treated ;

(*iv*) examine any records or registers or accounts the maintenance of which is prescribed ;

(*v*) enter and search without warrant any premises in which he has reason to believe that raw cotton or seed is being kept in contravention of this Act or the rules framed thereunder, provided that no such entry and search shall be made except by, or under the written authority of, an inspector who is a gazetted officer ;

(*vi*) exercise such other powers as may be prescribed.

12. *Penalties.*—Whoever does any act, or without reasonable cause omits to do anything, in contravention of the provisions of any of sections 3 to 8 and 10 or of the orders issued under section 9 shall be liable on conviction before a Magistrate of the first class—

(*a*) for a first offence or for a second offence in contravention of the same section —to a fine not exceeding two hundred rupees and

(*b*) for a third or subsequent offence in contravention of the same section—to a fine not exceeding five hundred rupees :

Provided that when any person is convicted of a first offence in contravention of any of the said sections the Magistrate may instead of sentencing him to a fine release him after admonition.

13. *Orders by Magistrate for disposal of raw cotton or seed in respect of which an offence has been committed.*—(1) Whenever any person has been convicted of an offence consisting of an act or omission in contravention of—

(*a*) Section 3,

(*b*) Section 4,

(*c*) Section 6, or

(*d*) Sections 7 or 8.

The Magistrate at the time of passing sentence or of releasing the offender after admonition shall also pass an order directing the offender—

in case of (*a*) as aforesaid, to cause the raw cotton in respect of which the offence has been committed to be ginned, and the seed so obtained to be treated, within such time as shall be specified in the order,

in case of (*b*) as aforesaid, either to cause the seed in respect of which the offence has been committed to be treated within such time as shall be specified in

the order or to cause it to be removed from the controlled area concerned within twenty-four hours,

in case of (c) as aforesaid, to cause the land in respect of which the offence has been committed to be ploughed over within such time as shall be specified in the order, or

in case of (*d*) as aforesaid, to cause the raw cotton or seed in respect of which the offence has been committed to be removed from the controlled area concerned within twenty-four hours.

(2) If the offender has failed to comply with the order passed by the Magistrate under sub-section (1) within the time specified, the Magistrate shall direct such officer as may be empowered in this behalf to execute the order forthwith or in his discretion, in case of (*a*), (*b*) or (*d*) as aforesaid, to cause the said raw cotton or seed to be destroyed by burning and all expenses incurred by the said officer in carrying out this direction shall be reported to the Magistrate and under his order shall be recovered from the offender in the manner provided by law for the recovery of fines, in addition to any fine to which the offender may have been sentenced.

14. *Power to make rules.*—(1) The Local Government shall make rules consistent with this Act in respect of the following matters, namely :—

(*a*) the fixing of dates by which raw cotton shall be ginned, the authorities by which such dates shall be fixed and the manner in which they shall be published,

(*b*) the fixing of dates by which seed shall be treated, the authorities by which such dates shall be fixed and the manner in which they shall be published and

(*c*) the methods by and the manner in which seed shall be treated.

(2) The Local Government may make such rules in respect of other matters as may be necessary for the purpose of carrying into effect the provisions of this Act.

(3) In particular and without prejudice to the generality of the power conferred by sub-section (2) such rules may provide for :—

(*a*) the conditions on and circumstances in which an area may be declared to be a controlled area,

(*b*) the issue of licences and certificates under section 8, the authorities by whom such licences and certificates may be issued, the conditions of such licences and the fees, if any, which may be charged for them,

(*c*) the specification in licences of places for the treatment of seed imported under sub-section (1) of section 8,

(*d*) prescribing the authority by whom and the conditions under which a licence may be issued for the export of raw cotton from a controlled area,

(*e*) the maintenance of records, registers and accounts according to the provisions of section 10,

(*f*) the appointment of inspectors and the exercise by them of the powers conferred by section 11 and the conferring on them of such other powers as may be necessary for the purposes of this Act,

(*g*) the empowering of officers to carry out the orders of a court under sub-section (2) of section 13 and the manner in which such orders shall be carried out, and

(*h*) the delegation of its powers by the Local Government.

(4) All rules made under this section shall be subject to the condition of previous publication.

(5) All such rules shall be published in the *Government Gazette* and shall, unless some later date is appointed, come into force on the date of such publication.

15. *Delegation of powers.*—The Local Government may delegate such of its powers under this Act, as it thinks fit, save the power to make rules under section 14, to the Divisional Commissioner or the Director of Agriculture or to a District Officer, in accordance with rules framed under this Act.

16. *Protection to persons acting under this Act.*—No suit, prosecution or other legal proceeding shall lie against any person for anything which is in good faith done or intended to be done under this Act.

STATEMENT OF OBJECTS AND REASONS.

The cotton crop of the United Provinces is subject to attack by the caterpillar of the moth *Platyedra gossypiella* Saund, commonly known as the Pink Boll-worm of cotton. The larva is carried over from season to season in cotton seeds which the caterpillar hollows out and in which it lies dormant until the favourable conditions produced by the monsoon bring forth the moth; the latter lays its eggs on the cotton plant and the larvæ when they emerge find their way into the cotton buds or bolls.

2. This pest destroys upwards of 25 per cent. of the crop in normal years and in some years reduces the return to the grower by half; the normal loss to the cultivator is estimated at from Rs. 10 to Rs. 15 per acre. Further, the intensity of this infestation coincides with the period of development of most of the bolls in varieties of cotton of greater lint length and better spinning quality; thus preventing the profitable growth of better varieties in the province. It is therefore necessary to control the pink boll-worm pest to enable cotton to be more extensively and profitably grown.

3. As a result of continued research it has been ascertained that the treatment of all cotton seed by heating it to an appropriate temperature diminishes the attacks of this pest, with consequent increase in yield. It is possible to deal with small village stocks by exposing cotton seed to the heat of the sun for two hours in April and May. But other methods are necessary if large stocks are to be rendered innocuous. Heating in special heaters at the time of ginning is the only safe remedy. Legislation is therefore required to ensure that organized treatment of all cotton seed should be properly carried out by approved methods in suitable cotton growing areas so as to increase the outturn and improve the quality of the cotton crop, for the benefit of the cultivators and also of the cotton industry in the province.

J. P. SRIVASTAVA,
Minister for Education.

NOTES ON CLAUSES.

Clause 3.—Experience has shown that unginned cotton cannot be conveniently or satisfactorily treated; accordingly it is proposed that ginning should be completed by a particular date, so that the seed may be effectively treated at the proper time. The exact date would vary according to the season and locality and the variety of cotton grown

and it is therefore proposed to leave the notification of this date to be prescribed by rules and only to mention the latest days in the Act itself.

Clause 4.—It is necessary that all seed within a controlled area should be treated in such manner as to prevent any possibility of its serving as a source of reinfection of the new crop. It is also necessary that the treatment should not damage the seed.

It is proposed to leave the method of treatment to be determined under the rules of the Act. At present the most satisfactory known methods of treatment are by sun heat or by steam heating apparatus. Future research in India or elsewhere may however discover other and more economical methods, e.g., electrical treatment. A greater degree of flexibility is attained in the choice of methods if the matter is left to be decided by rule than if specific reference is incorporated in the Act itself. Moreover, it will then be easier to allow discretion to factories to put up such heaters as they think suitable, provided they comply with the requirements of the rules.

It is necessary to fix a final date for the treatment of seed to ensure that there shall be no serious danger of reinfection of the planted crop through the emergence of moths from untreated stocks. Periods of moist heat, such as occasionally occur from April onwards, stimulate the emergence of the adult insects. It is therefore proposed to provide for such fixation of date as would combine the maximum of protection compatible with practicable treatment.

Sun heat is generally not strong enough for seed treatment before April. April 1, is therefore proposed as the earliest date to be notified for such treatment. It would be desirable that all treatment should be completed by April 15, but this may not be practicable and it is therefore proposed to allow a further month for the purpose. In practice the dates for particular areas are expected to be determined under the rules, the main determining factor being whether or not cotton is sown under irrigation. In any case the treatment should be completed before the first sowing date.

In normal practice factory-ginned seed would be treated within a few hours of ginning. A margin of seven days is suggested to safeguard ginneries in the event of their seed treatment being in arrears of their ginning. It is intended that the date actually fixed under the rules by the authorities concerned will be determined to suit the convenience of the ginning interests. In practice this is likely to be much earlier than the extreme date, as ginners would prefer a fully employed shorter ginning season than one in which *kapas* continues to be delivered late in driblets involving frequent slack or idle periods.

Clause 5.—It is essential to the smooth working of any scheme of control that no stocks of untreated machine-ginned seed should be allowed to issue from the ginnery premises at any time. The ultimate destination of such issues could only be determined by a system of checks and enquiries which would be laborious to inspecting officers and vexatious to the trade, and the success of which could not be guaranteed. There is, of course, no limitation to the movement of treated seed, and consequently no danger that this provision will interfere with adequate seed supply.

Clause 6.—The sowing of untreated seed has to be prohibited if the pest is to be brought under control.

Clause 7.—The importation of raw cotton after the close of the factory ginning season would be a serious menace, and has no commercial justification. If required to augment the seed supply, the necessary seed can be imported as such.

Clause 8.—It is necessary to preclude reinfection of a controlled area by the introduction of infested seed. It is therefore proposed that control should take the form of licence to import, which will be issued by the Collector or other officers, to whom powers have been delegated for the purpose.

Seed certified to have been treated in another controlled area will be under no restrictions. Untreated seed must be treated effectively and reasonably quickly, and there must be adequate safeguards against reinfection prior to treatment. These requirements are met by permitting import by rail only, and to places in which treatment facilities are available and have been arranged for by the importer; by importing in sound bags; and by limiting the time the seed may be held pending treatment.

Importation of untreated seed by road has to be absolutely prohibited. The dangers of reinfection from such a source are obvious, both by escapes during transit, and by possible leakages *en route*.

Clause 9.—It has been urged on behalf of ginners that if they have to bear the cost of the treatment of cotton seed, they can only do so by increasing their ginning charges. The latter may result in cultivators taking their raw cotton outside the controlled area for ginning purposes. Accordingly, it is provided that the Local Government may by order prohibit the export of raw cotton from the controlled area, except under licence, during such periods as may be specified. Normal trade relations will not thus be affected.

Clause 10.—It is necessary that all persons who engage in power ginning of *kapas* should maintain sufficient records of the *kapas* received for ginning, of the treatment of the ginned seed, and of the issues of the seed as will enable a check to be maintained. Provision for the maintenance of the majority of such records is included in the Cotton Ginning and Pressing Factories Acts. This however only applies to such ginning premises as come under the Factories Act. Hence the maintenance of such records as may be necessary has to be provided for.

Clause 11.—It is not anticipated that any special staff will be required to be appointed as inspectors under the Act. The staff required for propaganda and supervision in the villages will presumably also function as inspectors within prescribed limits. The powers actually entrusted to inspectors will be more or less circumscribed in accordance with their status.

APPENDIX IX.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—*Broach Tract.*—The group of Sonsek Co-operative Cotton Sale Societies which was taken up last year within the controlled area for 1027 *A.L.F.* reverted to the policy of growing so called *Selection I-A* seed as better prices were not realised for 1027 *A.L.F.* during the previous year as a result of damage due to frost; this group was accordingly excluded from the Departmental supervision during 1935-36 as a result of which the controlled area was reduced from 23,751 acres to 12,826.

Out of 1,085,411 lbs. of 1027 *A.L.F.* seed purchased last season 289,616 lbs. were supplied to Chhota Udepur and the remaining 795,795 lbs. were distributed from 20 depots in the Surat tract. Besides, the Hansot Co-operative Cotton Sale Society supplied 33,495 lbs. seed direct to its members, the total quantity of seed distributed thus being 1,118,906 lbs. The Rajpipla and Baroda States obtained their requirements of seed locally.

DECCAN.—*Ahmednagar District.*—Of the total area of 188,695 acres under cotton in this district during the year 1935-36, 1,981 acres were under *Banilla* which the Agricultural Department is trying to spread. This variety gives better yield than the local mixture and fetches Rs. 5 to Rs. 6 per *khandi* of 500 lbs. of *kapas* more than local cotton.

Sholapur District.—In this district the total area under *Banilla* cotton was 9,300 acres. Its popularity among cultivators is increasing owing to its higher yield and also because the prices it fetches are better by Rs. 6 to Rs. 8 per *khandi* of 500 lbs. than the local variety. The dry crop gives 350 to 400 lbs. of seed cotton per acre on an average and the irrigated crop 800 to 1,000 lbs.

DECCAN CANALS.—The total area under cotton in the Deccan Canals, *viz.*, Godavari, Pravara and Nira Right and Left Bank Canals, was about 20,000 acres during the year 1935-36 against 17,000 acres during the previous year. The slight increase in acreage may be attributed to the better prices realised for seed cotton during the 1934-35 season. The Agricultural Department is continuing its propaganda for the extension of *Banilla* cotton in the canal areas where the area at present is about 6,000 acres. The Department has distributed in all about 30,000 lbs. pure seed of *Banilla* cotton; local merchants arrange for *Banilla* cotton to be ginned separately and they keep the seed for sale.

Khandesh.—The improved variety of cotton evolved by the Bombay Agricultural Department and named *Banilla* cotton (being a cross between *Bani* and *Comilla* varieties) has been introduced for general cultivation in Khandesh. In favoured localities it gives satisfactory yields, produces better and finer staple and possesses a 40 per cent. ginning outturn as compared to 34 per cent. of the local *Khandesh* cotton. During the year 1935-36 the area under *Banilla* cotton was about 125,000 acres representing about 10 per cent. of the total area under the cotton crop in the Khandesh tract (East and West Khandesh and Nasik districts). The outturn is estimated at 30,000 bales or on an average 100 lbs. of lint per acre.

A seed distribution scheme of the Indian Central Cotton Committee is in operation in this district and under it a total area of about 20,000 acres was organised for the multiplication of pure seed and 825,000 lbs. of seed were stocked for distribution in the coming season. *Banilla* cotton has been found to give higher yield and to be of better quality in the black soils of the Tapti belt than in the lighter types of soils.

KUMPTA.—*Dharwar Tract.*—The work of introducing two improved varieties of cotton, *viz.*, *Jayawant* and *Gadag No.* 1, was carried out on an extensive scale through the Hubli and Gadag Cotton Sale Societies, with the aid of funds provided by the Indian Central Cotton Committee. The reserved area maintained for multiplying pure pedigree

seed of *Jayawant* cotton at the Hubli centre was 25,377 acres against 21,000 acres ast year and that of *Gadag No.* 1 at the Gadag centre was 25,259 acres as against 25,012 acres of the previous year. The quantity of seed received by the Societies from these reserved areas was 1,281,670 lbs. of *Jayawant* and 1,036,811 lbs. of *Gadag No.* 1, sufficient to cover 128,167 and 103,680 acres, respectively, during 1936-37.

For distribution of general pedigree seed stocked by the Co-operative Cotton Sale Societies, seed depôts were opened as usual in different selected centres. The general area grown with pure seed was 118,423 acres for *Jayawant* cotton as against 126,286 acres last year, and 58,434 acres for *Gadag No.* 1 cotton against 65,238 in the previous year. The estimated yield of *Jayawant* was 13,020 bales as against 15,000 bales last year, and 7,800 bales of *Gadag No.* 1, as against 4,600 bales in the previous year.

The Hubli Sale Society also sent outside its area of operation 590,100 lbs. of *Jayawant* seed enough for 59,010 acres. The total area under pure seed of *Jayawant* cotton was, therefore, 177,433 acres as against 191,336 acres last year. The Gadag Sale Society also distributed 84,163 lbs. of *Gadag No.* 1 seed, enough for 8,416 acres outside its own area of operation. The total area under *Gadag No.* 1, therefore, came to about 92,109 acres.

With a view to spread *Jayawant* cotton in other areas, separate seed multiplication blocks of 5,847 acres at the Athani centre, 933 acres at Bailhongal and 500 acres at Bagalkot were organised. 476,000 lbs. of pedigree seed, enough for 47,600 acres, have been stocked for distribution during 1936-37.

Jayawant cotton obtained an average of Rs. 4 more per *naga* of seed cotton (,1344 lbs.) in auction sales and *Gadag No.* 1 Rs. 8 more per *naga*. In the Athani centre the buyers gave on an average Rs. 20 more per *naga* of seed cotton (1,344 lbs.) over local *Kumpta*.

SIND.—Three main classes of cotton have been found to be successful in Sind, *viz.*, (*a*) Sind *deshi*, (*b*) *Sind-American*, (*c*) Imported *Egyptian* and *Sea Island* cottons.

Among each of these three main classes the Department of Agriculture in Sind has, by botanical selection, evolved improved strains which on account of better yield, high ginning outturn or superior quality, are suitable for extension in general cultivation in the different cotton growing tracts of the Barrage areas.

Sind Deshi Cotton.—This cotton has a special market of its own on account of its bright colour and rough feel, being suitable for mixing with wool. It is very hardy and resists variations in soil, climate and season. It is capable of giving high yields and can be sown late, *i.e.*, in the month of June. The improved Sind *deshi* strain 27*W.N.* now known as "Sind *N. R.*" cotton, evolved by the Agricultural Department, gives an early and abundant crop (about 16-20 per cent. greater outturn than ordinary Sind *deshi* and a 4-5 per cent. higher ginning outturn, *i.e.*, 38-39 per cent.). This improved *deshi* strain is now the standard *deshi* cotton in Sind. Trade opinion in Karachi considers that the total *deshi* crop, which can be profitably consumed, should not exceed 200,000 bales per annum. Any increase above this figure is expected to glut the limited market and result in reduced prices to the growers. The total area under *deshi* cotton in 1935-36 was 463,834 acres (including Khairpur State) with an estimated outturn of 189,800 bales of cotton.

Sind-American Cotton.—This cotton occupied in 1935-36 about 378,075 acres out of the total cotton area of 841,909 acres. 4*F* cotton has been the most popular variety grown in Sind. It has been partly replaced by other types, *viz.*, 289*F*, *N.T.* and *K.T.* cottons, but as the latter two have been found to be easily susceptible to red leaf disease and jassid attack their cultivation is being given up. The improved strains, established by the Agricultural Department, seed of which is being rapidly multiplied on a large scale, are definitely superior to the ordinary *Sind-American* and are quite distinct from the original material from which they have been evolved. These are :—

Sind-American 4*F*-98.—This cotton has a staple length of $\frac{7}{8}$″ to 15/16″ and spins 34's counts; it gives a high yield and has a ginning outturn of 33 per cent. This strain

forms the bulk of the crop in the new cotton growing areas on the Right Bank of the Indus, where it has been found to be the most suitable type for cultivation.

Sind Sudhar (289*F*-1).—This improved strain has a staple of 1"-1 1/16" long and spins 40's. It has a ginning percentage of 29-30 and in normal years is a very high yielder. This cotton is more resistant to red leaf disease, jassid attack and can withstand seasonal variations of climate better than ordinary *Sind-American*. Recognized as the "bread and butter" of the cotton growers in Sind in the Barrage areas it is now being grown in general cultivation all over the Left Bank of the Indus.

Imported Egyptian and Sea Island Cottons.—Selected strains of these cottons, acclimatised in Sind, have been produced by the Sind Agricultural Department, *viz.*, (1) *Sea Island* 2-4 and (2) *Boss III*-16 which have a staple length of 1¼"-1½" and are suitable for spinning 70-80's. Though tests on field scale show that strains grow well in East Sind, they are, however, susceptible to white ant attack, specially on virgin soils, and to seasonal variations. The area under the strains mentioned was during 1935-36 about 1,450 acres, and the average yield was about 8 maunds *kapas* per acre as against 12 maunds of *Sind-American* on good lands. These fine quality cottons need better soil and better cultivation than *Sind-American* or *deshi* cotton.

The economic side of the question, which is of primary importance to the grower, depends largely upon the prices prevailing for the various types of cotton. During 1935-36 these cottons were sold in large quantities both in Karachi and Bombay, at the following rates :—

	Sale of Cotton Lint in 1935-36.		
	Price per *candy* of 784 lbs.	Premium over Broach.	Remarks.
	Rs. a. p.	Rs. a. p. Rs.	
Sind N. R. (27 W. N.)	174 8 3	....	Karachi delivery.
Sind-American :—			
4*F*-98	206 10 10	19 10 10 on 187	,,
285*F*-2	226 15 0	39 15 0 on 187	,,
Sind Sudhar	267 0 0	80 0 0 on 187	Bombay delivery.
Sind Egyptian and Sea Island—			
Boss III-16	337 0 0	150 0 0 on 187	,,
Sea Island 2-4	337 0 0	150 0 0 on 187	,,

For successful cultivation of long-stapled and fine quality cottons it is necessary to evolve a reliable marketing organization which will secure adequate premium for quality from the trade. Indian mills have of late shown considerable interest in these long-stapled cottons and in order to ensure future supplies it is for them to encourage their production by offering the requisite premiums. The growers of Sind-American cotton, as also the ginners, are in constant fear of not getting an adequate price for staple cotton marketed in pure conditions.

Madras.—I. *The Southerns Tract—(A) Cambodia—Coimbatore.*—(i) The multiplication of pure *Co.* 2 *Cambodia* cotton seed for distribution to cultivators continued as usual, through the annual contract of seed farms with co-operative seed societies and

individual *ryots*. During the year there were 883 acres (under annual contract) of seed farms with four societies consisting of 130 members at Palladam centre as compared with 854 acres, 3 societies and 105 members in the preceding year. This area is under the direct supervision of the Agricultural Department and is known as the "Inner Area." The seed from the "Inner Area" was, as usual, supplied to the Tiruppur Co-operative Trading Society, Ltd., Tiruppur, which with assistance from the Local Government and the Indian Central Cotton Committee runs what is called the "Outer Area" comprising 5,320 acres, with 21 societies in Palladam and Avanashi Taluqs; the corresponding figures for the previous year were 5,152 acres, the number of societies being unchanged. The total seed farm area in 1935-36 was 6,203 acres as against 6,006 acres in the previous year.

(ii) Pure *Co.* 2 seed produced by the Agricultura lDepartment and the Tiruppur Co-operative Trading Society, including the natural spread, is estimated to have covered 153,000 acres in the district during the year as against 66,000 acres in 1934-35, while 13,168 lbs. of *Co.* 2 seed sufficient for sowing about 525 acres were supplied to other districts in the Presidency. Due to adverse weather conditions during 1935-36 season, the yield was about 50 per cent. less than normal and consequently there will not be much scope for increase in this strain in the coming season.

(iii) *Cambodia—Trichinopoly.*—In the Trichinopoly District 59,069 lbs. of *Co.* 2 *Cambodia* seed were distributed to the *ryots* by the Agricultural Department, as against 21,700 lbs. distributed in the previous year. The area covered by this variety during the year was 6,090 acres.

(*iv*) *Cambodia—Madura.*—The area under *Cambodia* seed farms (*Co.* 2, 920 and 1267) was 172 acres as against 176 acres in the previous year. The quantity of seed from the seed farm distributed during the year was 31,047 lbs., enough to cover an area of 2,079 acres as compared to 68,635 lbs. for 4,575 acres in 1934-35. The area under this improved strain as a result of distribution among *ryots* and other agency is estimated to be 42,037 acres.

(B) *Karunganni—Coimbatore.*—(1) The multiplication of *C.*7 *Karunganni* strain of Tinnevelly tract which has become popular in the Coimbatore District was continued through seed farms as for *Co.* 2 with a corresponding reduction in the Uppam area. During the year under report there were 542 acres of seed farm at Udumalpet with 19 *ryots*, as against 745 acres of seed farm with 20 *ryots* in the preceding year. With the distribution of 54,992 lbs. of *C.* 7 *Karunganni* cotton seed in 1935-36 and including the natural spread, the area under this strain is estimated at 28,000 acres, with an estimated yield of 5,200 bales of 400 lbs. net. The seed farm lint of 1934-35 commanded an average premium of Rs. 5 per *candy* of 500 lbs. on the date of sale.

Karunganni—South.—(i) The area under *Karunganni* strains *C.*7, *A.*10 and *KPT.* 1 seed farms was 1,292 acres as against 1,330 acres of the previous year. *KPT.* 1 (Strain No. 2622) is replacing strains *C.* 7 and *A.* 10 as it is a better yielder than either of the two and it does well in bad seasons also. The quantity of seed distributed from seed farms in 1935-36 was 181,700 lbs. sufficient for an area of 15,100 acres as compared to the distribution of 133,800 lbs. for 11,100 acres in 1934-35. The area (including seed farms) under these strains as a result of distribution among *ryots* is estimated to be 153,200 acres.

(ii) In the Trichinopoly District, 3,270 lbs. of *C.* 7 *Karunganni* seeds were distributed to the *ryots*; about 695 acres were sown to this cotton.

II. Northerns and Westerns Tract.—*A. Northerns.*—(*N.* 14).—The seed farms under *N.* 14 variety were again started at the instance of Messrs. Binny & Co., on an area of about 90 acres distributed in the *taluqs* of Nandyal, Koilkuntla and Sirvel of the Kurnool District where this variety was reported to thrive better than in other *taluqs* in the tract. The average yield of *kapas* per acre during 1935-36 was 200 lbs. as compared to an exceptionally good yield of 350 lbs. during 1934-35. The premium paid by Messrs. Binny & Co. this year was Rs. 30 per *candy* of 500 lbs. against Rs. 10 to Rs. 15 in the

previous year. There is now on hand a stock of seed sufficient to sow about 1,000 acres during the next sowing season. The area of natural spread under this variety is reported to be about 2,280 acres.

B. *Westerns.—H.* 1 *strain.*—The seed farm during 1935-36 was concentrated in nine villages round about Guntakal and consisted of 3,265 acres against an area of 3,588 acres during the previous year. Due to adverse seasonal conditions and consequent low yield during the previous year 69,520 lbs. only of *H.* 1 seed could be distributed during the year as against 291,233 lbs. in the previous year. The average yield during 1935-36 was 225 lbs. of *kapas* per acre. This variety has spread to the Proddatur *taluq* of Cuddapah district where it is reported to be grown on about 5,000 acres. The total natural and departmental spread under *H.* 1 during the year under report are 214,655 acres and 8,610 acres respectively.

CENTRAL PROVINCES AND BERAR.—The outstanding feature of the year was the success achieved by the new strain *V.* 434 which has proved its superiority over the other strains in practically all parts of the province in spite of an unfavourable season. Grown under varied conditions of soil and climate, it has proved to be the best all round type, more resistant to the vagaries of climate, hardy, prolific and superior in staple. As a result it has now been fairly widely introduced in many places in these provinces, gradually replacing *Verum* 262. Its spinning performance is excellent, being adjudged suitable for spinning highest standard warp counts of 37's. The total area under *Verum* cotton in the Central Provinces and Berar during the year 1935-36 was 103,537 acres; statistics collected show that *Verum* cotton equivalent to 18,075 bales was marketed up to the end of April 1936, out of which 1950 bales were *V.* 434, No. 438 and late *Verum.*

UNITED PROVINCES—C. 402.—Over 1,400 acres of this strain were grown in the Hardoi district with the assistance of the staff provided by the Indian Central Cotton Committee. A considerable proportion of the crop was handled by the U. P. Cotton Purchase and Sale Society, Bilgram, with great success, and as a result of this, and of departmental propaganda, the area sown for 1936 crop was nearly doubled.

C. 402 combines improved fibre quality with high ginning percentage and is regarded by the local mills as superior to *Broach.*

C. 520.—This selection continues to spread on account of its early maturity, high yield and high ginning percentage; the fibre properties are much superior to the average *Bengals.*

PUNJAB.—(i) The total area under American cotton in British districts was 1,305,500 acres, of which 4-*F* was grown on 1,118,900 acres and 289-*F* on 64,600 acres. 43-*F*, a new early maturing cotton recently evolved by the Cotton Research Botanist, was grown on an area of 6,000 acres; it is estimated that the area under this cotton will rise to over 25,000 acres during 1936-37.

(ii) Out of 1,497,300 acres under *Deshi* cottons in the Province (excluding Indian States) during the year, *Mollisoni* was grown on 571,500 acres, the greater proportion being under new types—15 *Mollisoni* and 39 *Mollisoni.*

(*i*) *American Cotton*—47-*F.*—This is a new early strain and has all the desirable characteristics of 43-*F* with the addition of a higher ginning outturn. The plant is very sturdy and hairy and is thus resistant to Jassids. During the last two years the yield of this strain in the comparative trial plots has been very satisfactory.

(ii) *Desi Cotton.*—With a view to improve the length of lint of *Desi* cotton, 15 *Mollisoni* was crossed in 1930 with Million Dollar, a Chinese cotton with medium lint. Successive hybrid generations were critically examined to find out a suitable combination of desirable characters in one plant, and as a result a variety called "Jubilee Cotton" has been evolved which resembles *Mollisoni* in outward appearance, but has a much superior lint. A comparison between the spinning performance of 4-*F.* "Jubilee Cotton" and *Mollisoni* showed that 4-*F* can spin on the average 21's, ordinary *Mollisoni* 6's to 8's

and "Jubilee Cotton" from 16's to 18's. Messrs. E. D. Sassoon & Co., Bombay, who spun a bale of this cotton and made it into sheeting cloth expressed themselves highly satisfied with its performance both on the spindle and on the loom.

BURMA.—The total area under improved strain *C*.19 was 4,251 acres; the resultant crop gave an average ginning outturn of 38 per cent. as against 32 per cent. ordinary *Wagale*. The total quantity of *kapas* of the improved strain ginned at the Mahlaing Central Farm ginnery was 111,771 *viss*, and 63,172 *viss* of *C*.19 seed are available for distribution.

As a result of experiments conducted at Mahlaing Central Farm two hybrid strains *L*11 x *W*6 and *C*19 x *W*5 were found to be superior to *C*.19 and *Wagale* in quality as well as yield. The commercially ginned crop of these hybrid strains spun and reported on very favourably by the Master Spinner of the Myingyan Spinning Mill, thus confirming the original report of the Technological Laboratory (*vide C. A No.* 16). In consultation with the trade it has been decided to multiply these two strains in separate tracts.

RAJPIPLA STATE.—The Rajpipla State has continued its policy of maintaining the improved strain 1027 *A.L.F.* as a pure crop throughout the State. No other variety is grown and the purity is maintained (1) by the annual distribution by way of *Takavi* of selected seed obtained by special arrangement for the purpose, (2) by the Cotton Transport Act which prohibits and penalizes the sowing or importing into the State for purposes of sowing *Goghari* cotton seed or any other short staple seed and (3) by the control of ginning and pressing factories for the prohibition and prevention of admixture of short staple varieties with the pure 1027 *A.L.F.* crop of the State. As a result of these measures the cultivators of the State have always found a ready market for their cotton at their own doors. Besides the practice of organizing meetings at different agricultural centres of the State for the sale of the cotton crop to the highest bidder has resulted in cultivating a spirit of combination among the growers to dispose of their cotton at the best prices.

(2) Rajpipla cotton (known by the term *Jhagadia* cotton in the market) is now recognised as equal to the very best cotton and is largely sought after. A notable feature of this year also was that though the seed was selected from the local crop of 1027 *A.L.F.* variety the crop flourished so well that the State was able to put in the market the highest output of cotton *viz.*, 36,078 pressed bales ever achieved since 1924, the year when compulsory cultivation of 1027 *A.L.F.* variety of cotton was introduced in the State; the quality of the crop this year also maintained its usual high standard.

BARODA STATE.—(1) *Navsari District.*—An area of about 75,000 acres is now under fairly pure 1027 *A.L.F.* seed. The Goghari Cotton Control Act came into force in the district from the 25th April 1936.

(2) *Baroda District.*—Extension of *B*.9 cotton in the district in areas where wilt was not much in evidence was in progress and the seed of *B*.9 cotton supplied in the district amounted to 14,480 lbs. sufficient to cover 1,448 acres.

(3) *Mehsana District.*—Attempts are being made to introduce *Wagad No.* 8 in place of local *Wagad* but lack of pure seed in sufficient quantity has hindered effective progress.

(4) *Amreli District.—Dhulia* cotton of which a good deal was hoped for on the basis of earlier trials on the farm has not, on the whole, come up to expectations. Its weakness lies in the marked tendency to shed its bolls heavily under certain moisture conditions in late September or early October. Some recovery of this loss is possible in irrigated areas but not when sown, as is most of the cotton, under dry conditions.

Some growers, however, continue to grow it on account of its higher ginning percentage. Trials of other types are being pushed forward. The correct solution is a cotton breeding station for Kathiawar and this, it is expected, will be brought into existence next year at Amreli in the Indian Central Cotton Committee's Dholleras Cotton Improvement Scheme

HYDERABAD STATE.—(1) *Gaorani tract.*—423,071 lbs. of *Gaorani* seed sufficient for an area of about 43,424 acres was purchased by the agricultural Department and distributed on *Takavi* loan system to cultivators in the Nanded district. Seed of two selected superior strains of *Gaorani* was distributed in selected villages amounting to 21,892 lbs. sufficient for about 1,479 acres.

(2) *Aurangabad District.*—Distribution of *Banilla* seed was continued, with a view to replace the inferior mixture now grown in the district. 115,000 lbs. of seed sufficient for about 7,200 acres were distributed by the Agricultural Department on *Takavi* system.

(3) *Parbhani District.*—Distribution of seed of *Verum* 262 was continued, with the object of replacing the present inferior variety. 40,000 lbs. of seed sufficient for about 2,500 acres were distributed by the Agricultural Department on *Takavi* system.

(4) *Raichur District.*—Distribution of seed of improved varieties was continued, with a view to replace the local inferior types of *Kumpta* and mixed *Dharwar-American.* Seed of *Jayawant* variety amounting to 187,474 lbs. sufficient for about 18,747 acres and seed of *Gadag No.* 1 amounting to 37,138 lbs. sufficient for about 3,709 acres were distributed on *Takavi* system.

APPENDIX X.

BALANCE SHEET AS AT 31st MARCH 1936.

Receipts.	Rs. a. p.	Rs. a. p.	Expenditure.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		1,05,24,795 6 8	*I. A. Administration*		16,70,773 6 5
Interest received on investments	16,16,181 13 1		B. *Improvement of Cotton Marketing*—		
Add—Refund of income tax deducted from interest	18,072 13 0		1. Cost of exhibits, moisture tests, etc.	88,977 5 5	
	16,34,254 10 1		2. Cost of growing cotton in India	1,95,140 12 6	2,84,118 1 11
Less—Interest paid in advance at the time of purchasing Government Paper (since recovered) interest on temporary overdraft and Bank's commission for collection of interest	56,347 9 2		C. *Seed Distribution & Extension Schemes*—		
Interest credited to Provident Fund account	4,886 6 2		(i) Bombay Presidency—		
Bank's withdrawal charges for Securities sold	4,227 11 0		(1) Hubli	42,524 13 10	
Income-tax on interest	20,158 3 6		(2) Gadag	41,045 2 7	
Brokerage for securities sold	816 2 0		(3) Gadag Supplementary	20.167 11 4	
Provision for Sinking Fund	7,035 0 0		(4) Surat	46,431 10 4	
	93,470 15 10		(5) Athani	18,925 15 8	
		15,40,783 10 3	(6) Khandesh	1,59,727 9 0	
Profit on conversion and sale of Securities		2,50,459 10 2	(7) Deccan Canals (Banilla)	3,721 12 7	
Sinking Fund account		7,035 0 0	(8) B. D. (8)	1,065 0 0	
Miscellaneous Receipts		40,802 6 5	(ii) Madras—		
Refund from Provident Fund account for contributions disallowed		3,391 1 11	(1) Pay and allowance of Business Manager, Tiruppur	18,640 3 9	
Suspense Receipts	148 10 0		(2) Co. 2	25,762 3 2	
Less—Payment made	68 5 9		(3) H1	3,952 2 9	
		80 4 3	(iii) Sind	1,90,666 0 11	
			(iv) Hyderabad	30,086 12 1	
			(v) Central Provinces— Extension of long staple Cotton & marketing of Verum cotton	1,45,440 11 5	
			(vi) Baroda	5,755 12 5	
			(vii) Lyallpur ginnery	16,038 3 3	
			(viii) United Provinces C. 402	6,660 0 0	
					7,76,611 13 1
Carried over		1,23,67,347 7 8	Carried over		27.31,503 5 5

BALANCE SHEET AS AT 31ST MARCH 1936—*contd.*

RECEIPTS.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,23,67,347 7 8	Brought forward ..		27,31,503 5 5
		D. *Printing and Propaganda*—		
		(1) Publicity and Propaganda ..	82,447 9 5	
		(2) Printing and Distribution	43,230 8 0	
				1,25,678 1 5
		E. *Statistical Research*—		
		(1) Studies of village consumption of cotton	21,522 9 9	
		(2) Forecast Improvement Scheme ..	9,182 15 9	
				30,705 9 6
		II. *Technological Research*—		
		1. Technological Laboratory—		
		A. Capital Expenditure :—		
		1. Land and Buildings	4,06,286 7 0	
		2. Machinery	96,690 6 10	
		3. Freight	7,502 2 8	
		4. Apparatus and Equipment	41,558 3 7	
		5. Machinery workshop	5,789 8 3	
		B. Working Expenses	16,84,064 0 3	
		2. Provincial	81,933 7 3	
		3. Development of alternative uses for Indian cottons	235 7 11	
				23,24,059 11 9
		III. *Research Studentships*	2,49,034 8 9	
		Less—Amount recovered from Mr. Taskhir Ahmad	49 12 0	
				2,48,984 12 9
Carried over ..	1,23,67,347 7 8	Carried over ..		54,60,931 8 10

BALANCE SHEET AS AT 31st MARCH 1936—*contd.*

Receipts.	Rs. a. p.	Expenditure.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,23,67,347 7 8	Brought forward ..		54,60,931 8 10
		Agricultural Research Grants—		
		IV. *Bombay*—		
		1. A. Surat Physiological	2,45,139 11 3	
		B. „ Writing-up	5,814 7 8	
		2. A. „ Bollworm	1,14,509 9 7	
		B. „ Bollworm Propaganda	91,468 9 2	
		C. „ Bollworm Writing-up	2,315 3 0	
		3. A. Dharwar Wilt	1,82,836 4 11	
		B. „ Writing-up	10,902 10 3	
		4. Khandesh	26,573 5 0	
		5. Co-ordination of Cotton Research	1,749 7 6	
		6. Jalgaon Cotton Breeding	31,116 6 3	
		7. Broach „ „	36,988 0 11	
		8. Small Leaf Disease Survey	3,938 9 6	
		9. Survey of Goghari cotton in Bombay Presidency ..	1,380 0 0	
		10. Defibration of cotton seed in Bombay Presidency ..	4,715 0 0	
		11. Plant Puller Propaganda	5,289 0 0	
		V. *Madras*:—		
		(*a*) Herbaceum	1,12,361 2 8	
		(*b*) Pempheres and Physiological	86,014 1 1	
		(*c*) Fodder Cholam	14,565 10 10	
		(*d*) Nadam Cotton Breeding	7,018 2 5	
		VI. *Punjab*:—		
		(*a*) Botanical	4,73,058 15 4	
		(*b*) Entomological	1,88,843 10 1	
		(*c*) White Fly	46,671 3 2	
		(*d*) Root Rot	18,972 2 3	
		(*e*) Spraying Trials	10,812 11 3	
		(*f*) Defibrating and Delinting	6,872 10 0	
		(*g*) Survey of Disease of Malformation	1,730 10 6	
		(*h*) Physiological	32,867 8 0	
Carried over..	1,23,67,347 7 8	Carried over ..	17,64,524 12 7	54,60,931 8 10

BALANCE SHEET AS AT 31ST MARCH 1936—*concld.*

Receipts.	Rs.	a.	p.	Expenditure.	Rs.	a.	p.	Rs.	a.	p.
Brought forward ..	1,23,67,347	7	8	Brought forward ..	17,64,524	12	7	54,60,931	8	10
				VII. *Central Provinces:*—						
				(*a*) Botanical	3,84,607	3	6			
				(*b*) Entomological	6,023	15	0			
				VIII. *United Provinces:*—						
				(*a*) Pink and Spotted Bollworm	1,47,834	1	4			
				(*b*) Rohilkhand and Bundelkhand	14,611	4	1			
				IX. *Institute of Plant Industry, Indore*	14,33,943	12	0			
				X. *Sind*	2,21,565	0	5			
				XI. *Burma:*—						
				(*a*) Capital Expenditure	2,906	15	5			
				(*b*) Cotton Improvement	37,602	7	9			
				XII. *Hyderabad:*—						
				(*a*) Botanical	2,04,383	7	4			
				(*b*) Cotton Survey	33,871	0	4			
				(*c*) Pink and Spotted Bollworm	31,187	7	0			
				XIII. *Bikaner*	37,593	10	4			
				XIV. *Baroda:*—						
				(*a*) Root Rot	47,395	5	5			
				(*b*) Comparative Tests	4,251	5	3			
				(*c*) Survey of Goghari cotton	1,500	0	0			
				(*d*) Plant Puller Propaganda	2,347	8	0			
				XV. *Bengal Comilla*	5,147	2	0			
				XVI. *Mysore (Doddahatti cotton)*	988	0	0			
								43,82,284	5	9
				XVII. *Loans recoverable (but considered doubtful)*:—						
				1. Hubli Co-operative Cotton Sale Society	7,628	12	8			
				2. Gadag " " " "	4,455	0	2			
								12,083	12	10
				By suspense account				64	10	6
				By Balance				25,11,983	1	9
Grand Total ..	1,23,67,347	7	8	Grand Total ..	..			1,23,67,347	7	8

BALANCE SHEET AS AT 31ST MARCH, 1936.

Provident Fund Account.

——	Rs.	a.	p.	Rs.	a.	p.	——	Rs.	a.	p.	Rs.	a.	p.
Subscribers' contributions % ..	1,96,693	8	1				By advances to subscribers ..	36,196	2	0			
Less—Payments made to subscribers resigned ..	45,952	13	4				*Less*—Recoveries made upto 31st March 1936	32,617	10	0			
				1,50,740	10	9					3,578	8	0
Committee's contributions % ..	1,92,383	3	6				Accrued interest on Government Paper upto 31st March 1936, credited to subscribers for distribution				3,424	8	4
Less—Payments made to subscribers resigned and forfeitures for contributions disallowed ..	43,657	5	2										
				1,48,725	14	4							
Suspense Deposit of Mr. Dutt for his own contributions	1,046	4	10				By Balance				3,34,381	4	4
Suspense amount due to Peon Durbara Singh resigned ..	23	0	4										
				1,069	5	2							
Investment Fluctuations % ..				38,976	7	5							
Lapse and Forfeiture %				1,871	15	0							
Total	..			3,41,384	4	8	Total ..	..			3,41,384	4	8

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31ST MARCH 1936.

RECEIPTS.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
*Opening Balance	26,52,020 8 3	Administration of the Committee (including Improvement of Cotton Marketing, Seed Distribution and Extension, Printing and Propaganda) and Statistical Research		4,39,197 13 0
Receipts under Section 12 of the Indian Cotton Cess Act, 1923	6,82,678 0 1	Agricultural Research Grants-in-Aid		4,75,232 12 9
**Other Receipts	2,08,022 10 5	Technological Research		2,26,198 8 4
Interest on investments	1,22,039 8 5	Closing Balance (Government Paper at cost) :—		
		3½% Government of India Loan 1947-50 of the Face Value of Rs. 2,75,000	2,18,032 13 0	
*Includes Rs. 5,848-2-0 on account of Sinking Fund and Rs. 14,920-12-8 against Loans Recoverable from Hubli and Gadag Co-operative Cotton Sale Societies.		*4% Government of India Loan 1960-70 of the Face Value of Rs. 8,08,900	8,08,403 0 10	
		4½% Government of India Loan 1955-60 of the Face Value of Rs. 26,000	25,004 0 0	
		5% Government of India Loan 1939-44 of the Face Value of Rs. 2,09,000	1,88,664 3 6	
		5% Government of India Loan 1940-43 of the Face Value of Rs. 3,60,000	3,98,362 8 0	
		6% Bombay Municipal Bonds 1954 of the Face Value of Rs. 50,000	56,500 0 0	
**Includes Rs. 1,186-14-0 against provision for Sinking Fund for the year 1935-36 and Rs. 1,96,787-13-7 on account of Net Profit realised on Sale of Securities.		6% Karachi Port Trust Coupon Debentures 1955 of the face falue of Rs. 1,30,000	1,41,212 8 0	
		6% Rangoon Municipal Debentures 1956 of the Face Value of Rs. 3,83,500	4,15,328 2 0	
		3½% Indian Sterling Bearer Bonds of the Face Value of £ 20,000	2,20,688 14 10	
		Rs. a. p.		
		(Market Value on 31st March 1936, Rs. 29,50,253-9-0)	24,72,196 2 2	
		Imperial Bank of India Current Account	34,991 13 2	
		Imprest :—Committees Accounts, as certified by the Secretary .. 1,500 0 0		
		Technological Laboratory as certified by the Director, Technological Laboratory 500 0 0		
		High Commissioner for India, London, for Scholarships, (£100) 1,335 10 5		
		Director of Agriculture, Bombay Presidency, certified by the Director of Agriculture, Bombay Presidency 1,295 0 0		
		Plant Physiologist, Punjab, Certified by the Plant Physiologist, Punjab 100 0 0		
		Publicity Department 50 0 0		
		Undisbursed pay of a menial who has resigned .. 14 8 0	4,795 2 5	
		Suspense (Recoverable)	64 10 6	
		Loans Recoverable (but considered doubtful)	12,083 12 10	
		†Total Closing Balance ..		25,24,131 9 1
Total ..	36,64,760 11 2	Total ..		36,64,760 11 2

*4% Government of India Loan 1960-70 of the Face Value of Rs. 1,16,900 has been deposited with the Imperial Bank of India for security against any overdraft that may be required by the Committee.

†This includes Rs. 7,035 on account of provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and Certified Returns of the Committee, have obtained all the information and explanations we have required and certify that to the best of our information and explanations received, the above Statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, 16*th June* 1936.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

PROVIDENT FUND ACCOUNT AS AT 31st MARCH 1936.

——	Rs. a. p.	Rs. a. p.	Rs. a. p.	——	Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1935	2,64,489 10 7			By Balance :—		
Less :—Payments made during the year for a subscriber who died in 1934.	224 7 6			(Securities in Government Paper at Market Price)		
		2,64,265 3 1		3½% Government Promissory Notes of the face value of.. Rs. 1,60,900 0 0	1,56,374 11 0	
Subscribers' contributions ..	28,354 0 0			3½% Government of India Loan 1947-50 of the face value of Rs. 55,500 0 0	58,656 9 0	
Add :—Recoveries against advances	4,920 14 0	33,274 14 0		5% Government of India Loan 1939-44 of the face value of Rs. 25,600 0 0	27,760 0 0	
		2,97,540 1 1		4% Government of India Loan 1960-70 of the face value of Rs. 32,600 0 0	36,593 8 0	
Less :—Refunds to subscribers who have resigned	5,722 14 6			6½% Bombay Improvement Trust Loan 1937 of the face value of Rs. 17,500 0 0	18,243 12 0	
Advances to subscribers ..	4,284 15 0			Savings Bank Account with the Imperial Bank of India	2,151 7 0	
		10,007 13 6		Current Account with the Imperial Bank of India	34,601 5 4	
		2,87,532 3 7				
Committee's contribution received from Indian Central Cotton Committee at 100 per cent.		28,354 0 0				
		3,15,886 3 7				
Less :—Payments to subscribers who have resigned, including transfers to Lapse and Forfeiture Account for contributions disallowed		5,655 3 6	3,10,231 0 1	*Total Closing Balance		3,34,381 4 4
Interest received on investments		10,431 13 4				
Interest received on Advances to subscribers		158 12 4				
Refund of Income Tax deducted on interest received during 1934-35		107 5 0				
		10,697 14 8				
Less :—Interest paid during the year to subscribers who have resigned.	Rs. a. p.					
On their own contributions ..	50 7 7					
On Committee's contributions	52 7 11					
Interest paid in advance at the time of purchase of Government Paper (since received)	744 0 5					
Income-Tax deducted from interest on Investments (Recoverable)	230 10 5					
Bank's commission for collection of interest and cost of stamps ..	26 15 0					
Cost of stationery, etc.	15 15 0					
		1,120 8 4				
			9,577 6 4			
Lapse and Forfeiture Account			1,292 10 7			
Investment Fluctuation Account			13,257 3 0			
Suspense Account (Peon Durbara Singh's due for Provident Fund)			23 0 4			
Total			3,34,381 4 4	Total ..		3,34,381 4 4

*Includes Rs. 1,046-4-10 being Suspense Deposit with interest thereon of Mr. Dutt's own contribution.

Examined and found correct.

BOMBAY, 16*th June* 1936.

(Sd). S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31ST MARCH 1936.

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(a) Lands and Buildings.	(b) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
	Rs. a. p.	Yrs. Mths.		RESEARCH SCHEMES. Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
II. *Technological Research*—									
(1) Technological Laboratory :—									
(a) Capital Expenditure ..	5,71,399 3 8	Permanent.	1923.	5,57,826 12 4	4,06,286 7 0	1,50,223 9 9	....	....	
(b) Working Expenses ..	17,03,584 15 7		Jan. 1924	16,84,064 0 3	....	1,316 11 7	48,428 1 1	16,35,637 15 2	
(2) Provincial :—Capital	6,151 0 0		April 1928.	81,933 7 3	....	5,790 4 6	....	....	
Working	76,143 2 9	....	....	....	....	....	341 4 3	75,801 14 6	
(3) Development of alternative uses for Indian cottons ..	30,000 0 0	....	....	235 7 11	....	....	....	235 7 11	
Agricultural Research Grants.									
IV. *Bombay Schemes*—									
(1) Surat Physiological and Writing-up (a)	2,91,445 0 0	10 1½	Sept. 1923	2,50,954 2 11	....	....	23,334 5 2	2,27,619 13 9	(a) Physiological scheme closed down on 4th August 1932, and Writing-up scheme on 17th October 1933.
(2) (a) Surat Bollworm	1,20,720 0 0	7 7	Sept. 1923	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	Scheme closed down on 31st March 1931.
(b) ,, ,, Writing-up ..	2,420 0 0	0 4	July 1932.	2,315 3 0	....	....	....	2,315 3 0	
(c) ,, ,, Propaganda and Clean-up	1,28,764 0 0	4 0	1st April 1931	91,468 9 2	....	....	10,828 0 11	80,640 8 3	*This continuation scheme is financed from the savings of the Surat Clean-up Scheme. The sanction of the Government of India to the extension of 2 years from 1st April 1937 is awaited.
(d) Plant Puller Propaganda Scheme in Surat and Broach Districts ..	19,010 0 0	2 0 *2 0	1st April 1935 *1st April 1937	5,289 0 0	....	....	....	5,289 0 0	
(3) Dharwar—									
(a) Wilt and Cotton Breeding .	2,63,545 0 0	8 11	Sept. 1923.	1,82,836 4 11	....	....	13,713 3 7	1,69,123 1 4	Schemes closed down on 31st July 1932, and in July 1929.
(b) Writing-up	11,355 0 0	0 10	1st June 1932	10,902 10 3	....	....	....	10,902 10 3	Scheme closed down on 31st March 1933.
(4) Khandesh Cotton Breeding ..	27,995 0 0	5 5½	15th Oct. 1926.	26,573 5 0	....	....	....	26,573 5 0	Scheme closed down on 31st March 1932.
(5) Broach Cotton Breeding	65,000 0 0	5 —	1st April 1932	36,988 0 11	....	....	5,966 0 5	31,022 0 6	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1936—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
Agricultural Research Grants—(*continued*)				RESEARCH SCHEMES—*contd.*					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
IV. *Bombay Schemes*—(contd.)—									
(6) Jalgaon Cotton Breeding ..	41,111 0 0	5 0	1st April 1932.	31,116 6 3	....	....	3,171 8 9	27,944 13 6	
(7) Co-ordination of Cotton Research	23,991 0 0	....	Not to start.	1,749 7 6	....	....	....	1,749 7 6	
(8) Survey of Small Leaf Disease of cotton	5,118 0 0	1 0	6th Nov. 1933	3,938 9 6	....	....	495 2 6	3,443 7 0	Scheme closed down on 31st October 1934.
(9) Survey of Goghari cotton in Gujerat	5,000 0 0	5 0	16th Jan.1935	1,380 0 0	....	....	....	1,380 0 0	
(10) Defibration of cotton seed :—									
Recurring	5,250 0 0	3 0	1st Feb. 1936.	4,715 0 0	....	....	....	*1,015 0 0	*Provisional figures.
Non-recurring	3,700 0 0			....	....	3,700 0 0	....	....	
V. *Madras Schemes*—									
(1) Herbaceum	1,47,068 0 0	14 6	Dec. 1923.	1,12,361 2 8	....	....	*4,420 10 3	*1,07,940 8 5	* Do. do.
(2) Pempheres and Physiological ..	2,12,779 0 0	7 0	16th Sept. 1931.	86,014 1 1	....	....	6,891 5 10	79,122 11 3	
(3) Fodder Cholam :—									
(*a*) Capital	900 0 0	6 5	14th Jan. 1931.	....	....	881 11 7	....	....	
(*b*) Recurring	21,010 0 0			14,565 10 10	....	....	331 11 6	13,352 3 9	
(4) Nadam Cotton Breeding ..	13,780 0 0	5 0	14th June 1933.	7,018 2 5	....	....	404 0 0	6,614 2 5	
VI. *Punjab Schemes*—									
(1) Botanical :—									
(*a*) Capital Expenditure ..	31,330 0 0	14 7½	13th August 1925.	....	22,158 0 0	9,102 11 0	....	....	† Rs. 2,030 transferred to Capital from working grant.
(*b*) Working Expenses ..	†6,85,650 0 0			4,73,058 15 4	....	....	34,516 1 4	4,07,282 3 0	
(2) Entomological :—									
(*a*) Capital Expenditure ..	6,000 0 0	....	....	....	....	5,826 3 10	....	....	
(*b*) Working Expenses .. (Pink and Spotted Bollworms).	2,40,410 0 0	10 11	4th May 1926.	1,88,843 10 1	....	....	9,695 15 8	1,73,321 6 7	
(3) White Fly	56,087 0 0	5 5	1st May 1931	46,671 3 2	....	....	9,336 2 2	37,335 1 0	Scheme closed down on 30th September 1936.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1936—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES—*contd.*					
VI. *Punjab Schemes*—(contd.)	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(4) Root Rot	42,206 0 0	6 0	1st Sept. 1932.	18,972 2 3	....	....	181 4 9	18,790 13 6	
(5) Spraying Trials	14,400 0 0	3 0	8th July 1933	10,812 11 3	....	....	3,025 13 3	7,786 14 0	
(6) Physiological	1,86,420 0 0	5 0	15th March 1935.	32,867 8 0	....	....	3,559 2 0	29,308 6 0	
(7) Defibration and Delinting plants									
(*a*) Recurring	1,000 0 0	2 0	....	6,872 10 0	....	....	....	1,000 0 0	
(*b*) Non-recurring	6,700 0 0			....	....	5,872 10 0	....	....	
(8) Survey of disease of malformation	2,674 0 0	0 10	1st June 1934.	1,730 10 6	....	....	....	1,730 10 6	Scheme closed down on 31st March 1935.
VII. *Central Provinces.*—									
(1) Botanical	*61,000 0 0	2 6	Oct. 1923.						*The balance of this amounting to Rs. 3,100-13-5 lapsed on revision.
	5,36,150 0 0	13 0	1st April 1926	3,84,607 3 6	....	....	4,853 7 10	3,79,753 11 8	
(2) Entomological	6,773 0 0	2 0	2nd July 1934.	6,023 15 0	....	....	....	6,023 15 0	†Subject to the Government of India's sanction.
	†5,033 0 0	1 3							
VIII. *United Provinces*—									
(1) Pink Boll-worm :—									
(*a*) Capital Expenditure	54,000 0 0	8 0	(*d*)		....	49,511 5 6	....	....	(*d*) Scheme closed down on 31st July 1931. (*e*) Scheme closed down on 12th July 1934.
(*b*) Working Expenses	56,000 0 0		July 1923.	1,47,834 1 4	....	....	3,065 4 3	95,257 7 7	
(*c*) Recurring grant for staff	44,475 0 0	7 9½	(*e*) 1st Oct. 1926.						
(2) Rohilkhand and Bundelkhand Cotton Survey Scheme	19,000 0 0	3 8	1st July 1933	14,611 4 1	....	....	1,541 7 10	13,069 12 3	
IX. *Institute of Plant Industry, Indore*—									
(1) Capital Expenditure	(*f*)2,83,535 12 10	Permanent	Oct. 1924.	....	2,12,552 11 5	70,983 1 5	....	....	(*f*) Rs. 50,202-12-10 transfered from Recurring grant to Capital.
(2) Working Expenses	11,50,407 15 2			14,33,943 12 0	....	....	31,857 4 4	11,18,550 10 10	
X. *Sind*	2,74,346 0 0	9 9	10th July 1927.	2,21,565 0 5	....	....	19,093 2 0	2,02,471 14 5	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31ST MARCH 1936—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e. staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(a) Lands and Buildings.	(b) Machinery, apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES.—*concld.*					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
XI. *Burma*—									
(1) Capital Expenditure	3,000 0 0	....	....	2,906 15 5	....	2,906 15 5	....	....	
(2) Cotton Improvement	49,032 0 0	6 0	1st April 1931.	37,602 7 9	....	....	4,097 8 0	33,504 15 9	
XII. *Hyderabad*—									
(1) Botanical	3,59,617 0 0	9 11	10th May 1929.	2,04,383 7 4	....	....	17,461 15 10	1,86,921 7 6	
(2) Cotton Survey	39,165 0 0	5 0	28th June 1931	33,871 0 4	....	....	263 11 5	33,607 4 11	Scheme closed down on 27th June 1936.
(3) Pink and Spotted Bollworm ..	52,025 0 0 *43,580 0 0	3 4 *2 0	1st June 1933	31,187 7 0	....	....	580 4 3	30,607 2 9	*Subject to the Government of India's sanction and acceptance of certain conditions by the Hyderabad State.
XIII. *Bikaner*—Bengals Cotton Improvement :—									
(1) Capital Expenditure	14,500 0 0	10 0	1st Jan. 1931	....	8,584 6 9	3,735 1 9	....	....	
(2) Working Expenses	65,320 0 0			37,593 10 4	....	....	242 8 6	25,031 9 4	
XIV. *Baroda*—									
(1) Root Rot.— Capital ..	4,000 0 0	....		....	4,000 0 0	....	....	....	
Working ..	54,179 0 0	5 0	1st Feb. 1932	47,395 5 5	....	....	3,899 3 7	39,496 1 10	**Subject to the sanction of the Government of India.
	*37,390 0 0	** 5 4							
(2) Comparative tests of 1027 and 1A cottons	4,280 0 0	1 2	15th April 1932	4,251 5 3	....	....	145 11 6	4,105 9 9	Scheme closed down on 15th June 1933.
(3) Survey of Goghari cotton ..	5,000 0 0	5 0	1st Feb. 1935	1,500 0 0	....	....	....	1,500 0 0	
(4) Plant Puller Propaganda ..	9,380 0 0	2 0	1st Jan. 1936	2,347 8 0	....	....	....	2,347 8 0	
XV. Bengal Comilla Cotton ..	18,540 0 0	5 0	1st Dec. 1934	5,147 2 0	....	....	402 15 10	4,744 2 2	
XVI. Mysore (Doddahathi) Cotton ..	8,442 0 0	3 0	1st Nov. 1935	988 0 0	....	....	....	988 0 0	
XVII. Collection of Herbaceum cottons in Iran.	4,000 0 0	....	31st Aug. 1936	....	....	....	....	....	

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other moveable property.			
1	2	3	4	5	6	7	8	9	10
			SEED SCHEMES.						
t. *Bombay*—	Rs. a. p.			Rs. a. p.			Rs. a. p.	Rs. a. p.	
(*i*) Hubli	50,110 0 0	6 years	June 1930	42,524 13 10	....	....	5 14 0	42,518 15 10	Schemes closed down on 31st May 1936.
(*ii*) Gadag	54,545 0 0	6 „	June 1930	41,045 2 7	....	....	....	41,045 2 7	
(*iii*) Gadag Supplementary ..	21,448 0 0	4 „	10th June 1931	20,167 11 4	....	....	2,929 5 6	17,238 5 10	Scheme closed down on 10th June 1935.
(*iv*) Haveri	27,752 0 0	5 „	....	....	....	....	....	....	Not started.
(*v*) Athani	46,757 0 0	5 „(*a*)	5th April 1932	18,925 15 8	....	....	1,722 15 6	17,203 0 2	(*a*) Scheme closed on 31st May 1936.
(*vi*) Bailhongal	27,425 0 0	5 „	....	....	....	....	....	....	Not started.
(*vii*) Surat	96,050 0 0	9 „	1st April 1930	46,431 10 4	....	....	....	46,431 10 4	
(*viii*) Khandesh	2,70,340 0 0 20,787 0 0	5 „ 1 year.	1st May 1931	1,59,727 9 0	....	....	11,282 5 2	1,48,445 3 10	Receipts amounting to Rs. 1,10,000 are anticipated in the scheme. The grant of Rs. 20,787 for the extended period is after taking into account anticipated receipts of Rs. 6,000.
(*ix*) Deccan Canals	23,800 0 0	5 years	1st April 1934	3,721 12 7	....	....	5 4 0	3,716 8 7	This scheme is self-supporting due to anticipated receipts.
(*x*) B. D. 8.	10,460 0 0	8 „	1st Dec. 1935	1,065 0 0	....	....	23 3 0	1,041 13 0	
(*xi*) Revised Jayawant and Gadag No. 1	....	....	1st June 1936	....	....	....	....	....	Revised scheme sanctioned for one year only for the present from 1st June 1936 in which Hubli, Gadag, Athani, Haveri and Bailhongal schemes have been merged and expenditure being met from the savings of those schemes, and the Bombay Government contributing Rs. 8,900.
	....	....	1st June 1936	....	....	....	....	....	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UPTO 31st MARCH 1936—*concld.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of work.	Total expenditure upto 31st March 1936.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, i.e., staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
			SEED SCHEMES—*contd.*						
2. *Madras*—	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(*i*) Pay and Allowances of Business Manager, Tiruppur	21,050 0 0	5 years.	18th May 1931	18,640 3 9	....	....	148 8 0	18,491 11 9	Provisionally extended up to 14th September 1937.
(*ii*) Co. 2	81,310 0 0	5 „	15th Sept. 1932	25,762 3 2	....	....	83 13 0	25,678 6 2	
(*iii*) H 1	18,860 0 0	2 „ (*b*)	6th May 1933	3,952 2 9	....	....	....	3,952 2 9	(*b*) Scheme closed down on 16th July 1934.
Punjab-Lyallpur Ginnery	18,125 0 0	....	....	16,038 3 3	9,221 5 0	6,816 14 3	....	....	
Sind	3,89,540 0 0	8 years.	1st April 1931	1,90,666 0 11	....	....	5,780 3 9	1,84,885 13 2	
Hyderabad	35,466 0 0	6 „ & 6 months.	1st March 1930	30,086 12 1	....	....	....	30,086 12 1	Extension from 1st September 1936, to 28th February 1941 subject to the acceptance of the Committee's condition by the Hyderabad Government.
3. *Central Provinces*—									
(1) Verum cotton	1,17,900 0 0	8 years & 8 months.	1st Sept. 1930	73,544 2 5	....	....	....	73,544 2 5	Scheme closed down on 30th April 1934.
(2) Extension of Long Staple cotton and Marketing of Verum cotton.	1,25,528 0 0	3 years	1st April 1934	71,896 9 0	....	....	....	71,896 9 0	
7. Baroda	25,600 0 0	5 „	16th April 1934	5,755 12 5	....	....	*217 8 0	5,538 4 5	*Provisional figures.
8. United Provinces C402	45,800 0 0	5 „	1st May 1935	6,660 0 0	....	....	300 0 0	6,360 0 0	

APPENDIX XI.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from Mills in Indian States.)

Cotton Year: 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
Bombay Island	762,610	987,355	781,937	747,988	435,426	542,036	766,375	664,546	611,606	565,084	491,709	687,287	664,199
Ahmedabad	262,745	278,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257	348,009	373,345	326,558	320,982
Bombay Presidency	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,132,645	1,116,297	1,063,549	1,230,616	1,189,310
Madras Presidency	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707	292,013	278,060	312,164	365,423
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820	273,573	277,230	292,424	317,011
Central Provinces and Berar	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018	111,208	112,660	125,014	130,298
Bengal..	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390	103,784	107,633	101,101	98,892
The Punjab and Delhi ..	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681	80,854	71,939	83,897	89,430
Rest of British India ..	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342	31,935	35,139	38,575	38,010
Total—British India ..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,987,603	2,009,664	1,946,210	2,183,791	2,228,374
Total—Indian States*..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341	449,198
TOTAL—INDIA ..	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,346,396	2,360,924	2,336,326	2,612,132	2,677,572

* Figures for Indian States upto and including 1930-31, being based on yarn production returns, include foreign cotton also.

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from or Yarn Production figures of Mills in Indian States.)

Cotton Year: 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488	33,231	45,588	51,771
Mysore	43,571	44,320	89,619	46,590	43,326	49,293	50,596	47,168	51,196	50,708
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587	53,612	57,146	51,963
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306	49,362	56,318	72,163
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,036	111,430	114,229	113,379
Kathiawar States	46,809	52,581	57,224	64,454	20,283	18,849	18,868	26,506	35,438	37,397
Other Indian States					32,558	39,382	40,209	45,197	45,735	51,462
Pondicherry					18,350	20,257	23,170	23,610	22,691	20,355
Total Indian States ..	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341	449,198

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year: 1st September to 31st August.

(In Bales of 400 lbs. Nett.)

	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
Bombay Presidency	28,328	24,970	27,324	24,361	54,409	74,979	80,092	74,868	58,355	75,617
Madras Presidency	35,198	39,560	52,188	46,582	55,717	99,389	96,340	110,875	123,260	147,044
United Provinces	16,991	10,308	13,878	20,441	18,496	14,367	19,236	17,871	10,090	10,405
Central Provinces and Berar ..	40,762	20,861	6,924	16,243	15,771	20,743	17,462	18,382	20,544	27,502
The Punjab	3,910	4,739	3,760	4,361	4,307	2,317	2,149	..	5,535	3,110
Total ..	125,189	100,438	104,074	111,988	148,700	211,795	215,279	221,996	217,784	263,678

APPENDIX XII.

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS AND THE TRADE ON 31st AUGUST, 1935 AND 1936.

(In thousand bales* of 400 lbs. each.)

Trade Descriptions of Cotton.	Trade Stocks on 31st August.								Mill Stocks on 31st August.		Total Indian Trade and Mill Stocks on 31st Aug.	
	Bombay Island.		Karachi.		Rest of India.		Total India.		Total India.			
	1935.	1936.	1935.	1936.	1935.	1936.	1935.	1936.	1935.	1936.	1935.	1936.
Bengals—												
United Province	—	—	—	—	(a) 9	(a) 4	9	4	23	16	32	20
Punjab	—	—	27	19	(b) 4	(b) 5	31	24	8	12	39	36
Sind	—	—	14	6	—	(c) 2	14	8	3	3	17	11
Rajputana..	—	—	1	2	(c) 1	—	2	2	15	15	17	17
Others (Unclassified) ..	65	19	—	—	(c) 1	—	66	19	3	1	69	20
Total ..	65	19	42	27	15	11	122	57	52	47	174	104
Oomras—												
Central Provinces Oomras.	19	10	—	—	(d) †5	(d) †6	24	16	32	17	56	33
Berar Oomras	24	6	—	—	(e) 14	(e) 12	38	18	11	9	49	27
Khandesh—Banilla ..	—	—	—	—	—	—	—	—	13	7	13	7
Khandesh Oomras ..	19	10	—	—	(f) 4	(f) 2	23	12	15	6	38	18
Central India—Malvi ..	—	—	—	—	—	—	—	—	18	34	18	34
Central India—Others ..	14	15	—	—	(g) 4	(g) 11	18	26	10	10	28	36
Barsi and Nagar Oomras..	14	6	—	—	(h) 4	(h) 27	18	33	11	5	29	38
Total ..	90	47	—	—	31	58	121	105	110	88	231	193
Verum 262	—	—	—	—	—	—	—	—	6	12	6	12
Hyderabad Gaorani ..	—	—	—	—	(h) 10	(h) 4	10	4	52	50	62	54
Tota ..	—	—	—	—	10	4	10	4	58	62	68	66
Americans—												
Punjab—289-F (and New Types)	—	28	—	—	—	(b) 1	—	29	6	16	6	45
Punjab (Unspecified—4-F)	13	7	39	64	(b) 23	(b) 10	75	81	44	89	119	170
Sind—289-F and F-1 ..	—	24	7	18	—	—	7	42	10	15	17	57
Sind (Unspecified—4-F)..	17	2	4	28	—	(b) 1	21	31	19	18	40	49
Dharwar (Gadag 1) ..	—	—	—	—	—	—	—	—	6	4	6	4
Dharwar (Upland—Unspecified)	—	—	—	—	—	—	—	—	1	7	1	7
Cambodia (Coimbatore No. 2)	—	—	—	—	—	—	—	—	61	62	61	62
Cambodia (Unspecified)..	9	6	—	—	—	—	9	6	35	34	44	40
Total ..	39	67	50	110	23	12	112	189	182	245	294	434
Broach—												
Surat-Navsari (Surti) ..	8	61	—	—	—	—	8	61	26	42	34	103
Broach (Unspecified) ..	22	118	—	—	(c) 6	—	28	118	30	43	58	161
Tota ..	30	179	—	—	6	—	36	179	56	85	92	264
Dholleras—												
Mattheo	18	2	—	—	—	—	18	2	5	4	23	6
Cutch	—	—	—	—	—	—	—	—	2	—	2	—
Wagad	—	—	—	—	—	—	—	—	32	28	32	28
Dholleras (Unspecified) ..	27	143	—	—	(c) 7	(c) 6	34	149	10	6	44	155
Total ..	45	145	—	—	7	6	52	151	49	38	101	189
Southerns—												
Kumptas (Jayawant) ..	—	—	—	—	—	—	—	—	20	29	20	29
Kumptas (Unspecified) ..	—	23	—	—	—	—	—	28	51	49	51	77
Westerns (Jowari and Mungari)	22	15	—	—	(i) 9	(i) §55	84	100	42	52	104	179
Northerns			—	—	(i) 3				28	27		
Coconadas (& Warangal) .	—	—	—	—	(i)14	(i) 20	14	20	5	6	19	26
Karunganni	—	—	—	—	—	—	—	—	20	19	20	19
Tinnevellies	6	1	—	—	—	—	6	1	24	40	30	41
Salems	—	—	—	—	—	—	—	—	2	2	2	2
Unclassified	14	—	—	—	—	—	14	—	—	—	1	—
Total ..	42	74	—	—	26	75	68	149	192	224	360	373
Comillas	—	—	—	—	—	—	—	—	—	—	—	—
Burmas (Wagale & Wagyi).	1	—	—	—	—	—	1	—	1	3	2	3
Other Sorts (Unclassified) .	10	4	—	—	—	—	10	4	—	2	10	6
Total Indian Cotton ..	322	535	92	137	118	166	532	838	700	794	1,232	1,632

*Standard Indian bales of approximate average gross weight 400 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

N.B.—Detailed Statement of Mill Stocks on the 31st August 1936, is attached.

(*a*) At Cawnpore.
(*b*) In the Punjab.
(*c*) At Ahmedabad.
(*d*) In the Central Provinces
(*e*) In Berar.
(*f*) In East and West Khandesh Districts.
(*g*) In Indore and Gwalior States.
(*h*) In Hyderabad State.
(*i*) In the Madras Presidency.
† Includes 682 bales held at Ahmedabad.
‡ Includes 609 bales held at Ahmedabad.
Includes 5,000 bales held in Hyderabad State.

STOCKS OF RAW COTTON HELD BY THE

(Compiled from Voluntary

*(In thousand bales**

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras North.	Madras South.	Total Madras Presidency.	United Provinces.	Central Provinces.	Berar.	Total C. P. and Berar.	Bengal.
BENGALS—												
United Provinces.. ..	1	—	—	1	—	—	—	8	—	—	—	2
Punjab	2	—	—	2	—	—	—	1	—	—	—	—
Sind	—	1	—	1	—	—	—	—	—	—	—	—
Rajputana..	3	—	—	3	—	—	—	—	—	—	—	1
Others	1	—	—	1	—	—	—	—	—	—	—	—
Total ..	7	1	—	8	—	—	—	9	—	—	—	3
OOMRAS—												
Central Provinces Oomras.	1	—	—	1	—	—	—	—	14	1	15	1
Berar Oomras	2	—	—	2	—	—	—	—	5	2	7	—
Khandesh—Banilla ..	1	—	5	6	—	—	—	—	1	—	1	—
Khandesh Oomras ..	1	—	5	6	—	—	—	—	—	—	—	—
Central India—Malvi ..	2	2	—	4	—	—	—	—	—	—	—	—
Central India—Others ..	5	—	2	7	—	—	—	1	—	—	—	—
Barsi and Nagar Oomras..	1	—	4	5	—	—	—	—	—	—	—	—
Total ..	13	2	16	31	—	—	—	1	20	3	23	1
VERUM 262	1	—	—	1	—	—	—	—	8	3	11	—
HYDERABAD GAORANI ..	5	—	22	27	3	—	3	—	10	1	11	—
Total ..	6	—	22	28	3	—	3	—	18	4	22	—
AMERICANS—												
Punjab—(289-F and New Types)	9	1	—	10	2	1	3	—	—	—	—	3
Punjab (Unspecified-4-F).	19	—	—	19	—	16	16	24	1	—	1	8
Sind—289-F & F-1 ..	10	3	—	13	2	—	2	—	—	—	—	—
Sind (Unspecified—4-F)..	6	2	—	8	—	8	8	—	—	—	—	1
Dharwar (Gadag 1) ..	4	—	—	4	—	—	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	4	—	1	5	—	—	—	—	1	1	1	—
Cambodia (Coimbatore No. 2)	—	—	1	1	1	55	56	—	—	1	1	2
Cambodia (Unspecified) ..	10	—	1	11	1	21	22	—	—	—	—	1
Total ..	62	6	3	71	6	101	107	24	1	2	3	15
BROACH—												
Surat-Navsari (Surti) ..	14	18	3	35	—	—	—	—	1	—	1	1
Broach (Unspecified) ..	22	15	1	38	—	1	1	—	—	—	—	1
Total ..	36	33	4	73	—	1	1	—	1	—	1	2
DHOLLERAS—												
Mattheo	3	—	—	3	—	—	—	—	—	—	—	—
Cutch	—	—	—	—	—	—	—	—	—	—	—	—
Wagad	1	21	—	22	—	—	—	—	—	—	—	—
Dholleras (Unspecified) ..	4	2	—	6	—	—	—	—	—	—	—	—
Total ..	8	23	—	31	—	—	—	—	—	—	—	—
SOUTHERNS—												
Kumptas (Jayawant) ..	17	1	5	23	6	—	6	—	—	—	—	—
Kumptas (Unspecified) ..	17	—	10	27	5	—	5	—	—	—	—	—
Westerns (Jowari and Mungari)	12	1	13	26	9	1	10	—	—	—	—	1
Northerns..	1	—	—	1	18	1	19	—	—	—	—	—
Coconadas (& Warangal)..	—	—	2	2	1	—	1	—	—	—	—	1
Karunganni	—	—	—	—	—	18	18	—	—	—	—	1
Tinnevellies	1	—	—	1	—	39	39	—	—	—	—	—
Salems	—	—	—	—	—	2	2	—	—	—	—	—
Total ..	48	2	30	80	39	61	100	—	—	—	—	3
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale & Wagyi)..	—	—	—	—	—	—	—	—	—	—	—	1
OTHER SORTS	—	—	—	—	—	—	—	—	—	—	—	—
Total Indian Cotton ..	180	67	75	322	48	163	211	34	40	9	49	25
AMERICANS	10	—	—	10	—	—	—	—	—	—	—	—
EGYPTIANS	4	7	1	12	1	1	2	—	—	—	—	1
EAST AFRICANS	19	12	4	35	—	2	2	—	1	—	1	2
OTHERS (Sudan, Mesopotamia, etc.)	4	1	1	6	—	—	—	—	—	—	—	—
Total Foreign Cotton ..	37	20	6	63	1	3	4	—	1	—	1	3
GRAND TOTAL ..	217	87	81	385	49	166	215	34	41	9	50	28

*Standard Indian bales of approximate average gross weight 400 lbs.

MILLS IN INDIA ON 31st AUGUST, 1936.

Returns furnished by Mills.)

of 400 *lbs. each.*)

Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions o Cotton.
													BENGALS—
4	—	15	—	—	—	1	—	—	—	—	1	16	United Provinces
3	6	12	—	—	—	—	—	—	—	—	—	12	Punjab
—	—	1	—	2	—	—	—	—	—	—	2	3	Sind
—	10	14	—	—	—	—	—	—	1	—	1	15	Rajputana
—	—	1	—	—	—	—	—	—	—	—	—	1	Others
7	16	43	—	2	—	1	—	—	1	—	4	47	Total
													OOMRAS—
—	—	17	—	—	—	—	—	—	—	—	—	17	Central Provinces Oomras
—	—	9	—	—	—	—	—	—	—	—	—	9	Berar Oomras
—	—	7	—	—	—	—	—	—	—	—	—	7	Khandesh—Banilla
—	—	6	—	—	—	—	—	—	—	—	—	6	Khandesh Oomras
—	—	4	—	—	1	9	17	—	3	—	30	34	Central India—Malvi
—	—	8	1	—	—	—	1	—	—	—	2	10	Central India—Others
—	—	5	—	—	—	—	—	—	—	—	—	5	Barsi and Nagar Oomras
—	—	56	1	—	1	9	18	—	3	—	32	88	Total
—	—	12	—	—	—	—	—	—	—	—	—	12	VERUM 262
—	—	41	9	—	—	—	—	—	—	—	9	50	HYDERABAD GAORANI
—	—	53	9	—	—	—	—	—	—	—	9	62	Total
													AMERICANS—
—	—	16	—	—	—	—	—	—	—	—	—	16	Punjab—(289-F and New Types)
12	3	83	—	3	—	1	—	—	1	1	6	89	Punjab (Unspecified—4-F)
—	—	15	—	—	—	—	—	—	—	—	—	15	Sind—289-F & F-1
—	—	17	—	1	—	—	—	—	—	—	1	18	Sind (Unspecified—4-F)
—	—	4	—	—	—	—	—	—	—	—	—	4	Dharwar (Gadag 1)
—	—	6	—	—	—	—	—	—	—	1	1	7	Dharwar (Upland—Unspecified)
—	—	60	—	1	—	—	—	—	1	—	2	62	Cambodia Coimbatore No. 2)
—	—	34	—	—	—	—	—	—	—	—	—	34	Cambodia (Unspecified)
12	3	235	—	5	—	1	—	—	2	2	10	245	Total
													BROACH—
—	—	37	—	—	1	—	1	2	—	1	5	42	Surat-Navsari (Surti)
—	—	40	—	—	1	—	1	—	—	1	3	43	Broach (Unspecified)
—	—	77	—	—	2	—	2	2	—	2	8	85	Total
													DHOLLERAS—
—	—	3	—	—	—	—	—	1	—	—	1	4	Mattheo
—	—	—	—	—	—	—	—	—	—	—	—	—	Cutch
—	—	22	—	—	1	—	—	5	—	—	6	28	Wagad
—	—	6	—	—	—	—	—	—	—	—	—	6	Dholleras (Unspecified)
—	—	31	—	—	1	—	—	6	—	—	7	38	Total
													SOUTHERNS—
—	—	29	—	—	—	—	—	—	—	—	—	29	Kumptas (Jayawant)
—	—	32	—	14	—	—	—	—	3	—	17	49	Kumptas (Unspecified)
—	—	37	1	13	—	—	—	—	—	1	15	52	Westerns (Jowari and Mungari)
—	—	20	—	6	—	—	—	—	—	1	7	27	Northerns
—	—	4	1	—	—	—	—	—	—	1	2	6	Cocanadas (& Warangal)
—	—	19	—	—	—	—	—	—	—	—	—	19	Karunganni
—	—	40	—	—	—	—	—	—	—	—	—	40	Tinnevellies
—	—	2	—	—	—	—	—	—	—	—	—	2	Salems
—	—	183	2	33	—	—	—	—	3	3	41	224	Total
—	—	—	—	—	—	—	—	—	—	—	—	—	COMILLAS
—	2	3	—	—	—	—	—	—	—	—	—	3	BURMAS (Wagale & Wagyi)
—	—	—	—	2	—	—	—	—	—	—	2	2	OTHER SORTS
19	21	681	12	42	4	11	20	8	9	7	113	794	Total Indian Cotton
—	—	10	—	—	—	—	—	—	—	—	—	10	AMERICANS
—	—	15	—	3	1	—	—	—	—	—	4	19	EGYPTIANS
—	—	40	—	3	—	—	—	1	—	—	4	44	EAST AFRICANS
—	—	6	—	—	—	—	—	—	—	—	—	6	OTHERS (Sudan, Mesopotamia, etc.)
—	—	71	—	3	4	—	—	1	—	—	8	79	Total Foreign Cotton
19	21	752	12	45	8	11	20	9	9	7	121	873	GRAND TOTAL

and net weight 392 lbs. of cleaned (lint) cotton.

STOCKS ON 31ST JANUARY, 1935 AND 1936 OF "TINNEVELLIES," "SALEMS" AND "CAMBODIAS" HELD BY THE MILLS AND THE TRADE IN THE MADRAS PRESIDENCY.

(In thousand bales of 400 lbs. net.)

Trade Descriptions of Cotton.	Mill stocks on 31st January.		Trade stocks on 31st January.		Total stocks on 31st January.	
	1935.	1936.	1935.	1936.	1935.	1936.
Tinnevellies	21	14	7	12	28	26
Salems	10	6	2	3	12	9
Cambodias	42	41	11	22	53	63
Total ..	73	61	20	37	93	98

APPENDIX XIII.

EXPORTS BY SEA OF INDIAN RAW COTTON CLASSIFIED BY VARIETIES.

(Compiled from Voluntary Returns furnished by Exporters.)
1*st September* 1935 *to* 31*st August* 1936.
(In thousand bales* of 400 lbs. each.)

Trade Descriptions of Cotton.	Exported to				Total Exports.
	Europe (excluding United Kingdom) and the West.	United Kingdom.	Japan.	China and the East (excluding Japan).	
BENGALS—					
United Provinces	20	8	28	2	58
Punjab	210	73	223	16	522
Sind	130	40	37	1	208
Rajputana	9	7	8	—	24
Others	3	4	27	—	34
Total ..	372	132	323	19	846
OOMRAS—					
Central Provinces—Oomras ..	48	36	85	1	170
Berar—Oomras	37	13	204	4	258
Khandesh—Banilla	1	—	15	—	16
Khandesh—Oomras	33	—	175	10	218
Central India—Malvi	4	—	14	—	18
Central India—Others	20	1	122	28	171
Barsi and Nagar—Oomras ..	10	1	53	14	78
Unclassified	24	5	106	—	135
Total ..	177	56	774	57	1,064
VERUM 262	—	—	—	—	—
HYDERABAD GAORANI	1	—	6	—	7
Total ..	1	—	6	—	7
AMERICANS—					
Punjab—289-F	3	1	1	—	5
Punjab (Unspecified—4-F) ..	164	159	359	17	699
Sind Sudhar—(289-F & F-1) ..	2	3	—	2	7
Sind (Unspecified—4-F) ..	9	20	30	—	59
Dharwar (Gadag 1)	1	—	1	—	2
Dharwar (Upland—Unspecified)	—	—	10	—	10
Cambodia (Coimbatore No. 2) .	2	—	18	1	21
Cambodia (Unspecified) ..	7	5	11	—	23
Total ..	188	188	430	20	826
BROACH—					
Surat-Navsari (Surti)	10	2	18	—	30
Broach (Unspecified)	42	18	63	11	134
Total ..	52	20	81	11	164
DHOLLERAS—					
Mattheo	51	—	32	3	86
Cutch	—	—	7	—	7
Wagad	—	—	1	—	1
Dholleras (Unspecified) ..	3	—	73	6	82
Total ..	54	—	113	9	176
SOUTHERNS—					
Kumptas (Jayawant)	—	—	—	—	—
Kumptas (Unspecified) ..	—	—	—	—	—
Westerns (Jowari and Mungari)	19	—	45	2	66
Northerns	12	—	8	—	20
Coconadas (and Warangal) ..	18	13	—	—	31
Karunganni	5	1	3	—	9
Tinnevellies	9	4	42	—	55
Salems	1	1	—	—	2
Total ..	64	19	98	2	183
COMILLAS	52	11	5	1	69
BURMAS (Wagale and Wagyi) ..	1	2	6	—	9
OTHER SORTS (Unclassified) ..	4	1	2	5	12
GRAND TOTAL ..	965	429	1,838	124	3,356
Total exports, as per official returns, from British Indian and Kathiawar Ports—Bales of 400 lbs. net	1,097	533	2,062	134	3,826

* Standard Indian bales of approximate average gross weight 400 lbs. and net weight 392 lbs. of cleaned int) cotton.

APPENDIX

RECEIPTS AT MILLS IN INDIA OF

(Compiled from returns
1st September 1935 *to*
(In thousand bales*

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras Presidency.	United Provinces.	C. P. & Berar.	Bengal.	Punjab and Delhi.	Rest of British India.
BENGALS—										
United Provinces	11	—	1	12	—	92	1	12	28	—
Punjab	19	1	2	22	—	6	—	1	16	2
Sind	6	3	—	9	1	—	—	—	—	—
Rajputana	16	1	—	17	—	2	—	—	—	18
Others	8	—	—	8	—	—	—	—	—	—
Total	60	5	3	68	1	100	1	13	44	20
OOMRAS—										
Central Provinces Oomras	23	—	—	23	—	3	53	10	—	—
Berar Oomras	22	1	1	24	—	3	31	2	—	—
Khandesh—Banilla	5	—	18	23	—	—	1	—	—	—
Khandesh Oomras	19	1	15	35	—	—	1	—	—	—
Central India—Malvi	10	13	—	23	—	4	—	—	—	—
Central India—Others	36	3	3	42	—	12	—	2	—	—
Barsi and Nagar Oomras	7	—	19	26	—	—	—	—	—	—
Total	122	18	56	196	—	22	86	14	—	—
VERUM 262	4	1	1	6	—	—	23	—	—	—
HYDERABAD GAORANI	20	—	37	57	—	—	15	—	—	—
Total	24	1	38	63	—	—	38	—	—	—
AMERICANS—										
Punjab—289-F (and New Types)	26	5	1	32	8	1	—	6	13	—
Punjab (Unspecified—4-F)	79	2	1	82	38	36	4	35	35	6
Sind-Sudhar (289-F and F—1)	41	16	1	58	2	—	—	1	—	—
Sind (Unspecified—4-F)	44	11	2	57	30	—	—	2	—	—
Dharwar (Gadag 1)	5	—	1	6	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	9	1	3	13	—	—	—	—	—	—
Cambodia (Coimbatore No. 2)	4	1	2	7	110	—	1	2	—	—
Cambodia (Unspecified)	12	2	2	16	54	—	2	5	—	—
Total	220	38	13	271	242	37	7	51	48	6
BROACH—										
Surat-Navsari (Surti)	36	63	7	106	—	—	1	1	—	—
Broach (Unspecified)	76	50	3	129	1	—	—	2	—	—
Total	112	113	10	235	1	—	1	3	—	—
DHOLLERAS—										
Mattheo	18	1	—	19	—	—	—	—	—	—
Cutch	1	—	—	1	—	—	—	—	—	—
Wagad	6	96	3	105	—	—	—	—	—	—
Dholleras (Unspecified)	16	10	1	27	—	—	—	—	—	—
Total	41	107	4	152	—	—	—	—	—	—
SOUTHERNS—										
Kumptas (Jayawant)	31	2	8	41	6	—	—	1	—	—
Kumptas (Unspecified)	34	1	20	55	1	—	—	1	—	—
Westerns (Jowari and Mungari)	37	3	35	75	20	—	—	3	—	—
Northerns	2	—	—	2	12	—	—	—	—	—
Cocanadas (and Warangal)	1	—	2	3	4	—	—	4	—	—
Karunganni	1	—	—	1	47	—	—	2	—	—
Tinnevellies	3	—	1	4	64	—	—	1	—	—
Salems	—	—	—	—	5	—	—	—	—	—
Total	109	6	66	181	159	—	—	12	—	—
COMILLAS	—	—	—	—	—	—	—	—	—	—
BURMAS (Wagale and Wagyi)	—	—	—	—	—	—	—	2	—	9
OTHER SORTS	1	—	1	2	3	—	—	1	—	—
Total Indian Cotton	689	288	191	1,168	406	209	133	96	92	35
AMERICANS	21	2	—	23	—	—	—	1	—	—
EGYPTIANS	21	32	1	54	5	—	—	2	1	—
EAST AFRICANS	86	100	12	198	4	—	—	9	2	—
OTHERS (Sudan, Mesopotamia, etc.)	13	5	3	21	—	—	—	1	—	—
Total Foreign Cotton	141	139	16	296	9	—	—	13	3	—
GRAND TOTAL	830	427	207	1,464	415	209	133	109	95	35
Indian raw cotton consumed in mills in India. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lbs. net)	664	321	204	1,189	365	317	130	99	90	38

* Standard Indian bales of approximate average

XIV.

RAW COTTON CLASSIFIED BY VARIETIES.

furnished by Mills.)
31*st August* 1936.
of 400 lbs. each)

Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
											BENGALS—
145	—	—	—	13	—	—	4	—	17	162	United Provinces
47	—	2	—	—	—	—	1	—	3	50	Punjab
10	—	3	—	—	—	—	—	—	3	13	Sind
37	—	—	—	1	2	1	8	—	12	49	Rajputana
8	—	—	—	—	—	—	—	—	—	8	Others
247	—	5	—	14	2	1	13	—	35	282	Total
											OOMRAS—
89	—	—	—	—	—	—	2	1	3	92	Central Provinces Oomras
60	—	—	—	—	—	—	1	—	1	61	Berar Oomras
24	—	—	—	—	—	—	—	—	—	24	Khandesh—Banilla
36	—	—	—	—	—	—	—	—	—	36	Khandesh Oomras
27	—	—	7	54	68	—	10	—	139	166	Central India—Malvi
56	1	—	—	1	26	—	3	—	31	87	Central India—Others
26	—	—	—	—	—	—	—	—	—	26	Barsi and Nagar Oomras
318	1	—	7	55	94	—	16	1	174	492	Total
29	—	—	1	—	—	—	—	—	1	30	VERUM 262
72	23	—	—	—	—	—	—	—	23	95	HYDERABAD GAORANI
101	23	—	1	—	—	—	—	—	24	125	Total
											AMERICANS—
60	—	—	1	1	—	—	3	1	6	66	Punjab—289-F (and New Types)
286	—	5	—	19	—	1	2	3	30	316	Punjab (Unspecified—4-F)
61	—	—	—	—	—	—	—	—	—	61	Sind-Sudhar (289-F and F—1)
89	—	1	1	—	—	1	—	1	4	93	Sind (Unspecified—4-F)
6	—	—	—	—	—	—	—	—	—	6	Dharwar (Gadag 1)
13	—	—	—	—	—	—	—	1	1	14	Dharwar (Upland—Unspecified)
120	—	1	—	—	—	—	5	—	6	126	Cambodia (Coimbatore No. 2)
77	—	1	—	—	—	—	1	—	2	79	Cambodia (Unspecified)
712	—	8	2	20	—	2	11	6	49	761	Total
											BROACH—
108	—	—	5	1	1	6	1	2	16	124	Surat-Navsari (Surti)
132	—	—	4	—	2	—	1	1	8	140	Broach (Unspecified)
240	—	—	9	1	3	6	2	3	24	264	Total
											DHOLLERAS—
19	—	—	1	—	—	6	—	—	7	26	Mattheo
1	—	—	—	—	—	—	—	—	—	1	Cutch
105	—	—	9	—	—	19	1	—	29	134	Wagad
27	—	—	—	—	1	—	—	—	1	28	Dholleras (Unspecified)
152	—	—	10	—	1	25	1	—	37	189	Total
											SOUTHERNS—
48	—	—	—	—	—	—	—	—	—	48	Kumptas (Jayawant)
57	—	17	—	—	—	—	5	—	22	79	Kumptas (Unspecified)
98	3	15	1	—	—	—	1	2	22	120	Westerns (Jowari and Mungari)
14	4	8	1	—	—	—	—	1	14	28	Northerns
11	—	—	—	—	—	—	2	2	4	15	Coconadas (and Warangal)
50	—	—	—	—	—	—	—	—	—	50	Karunganni
69	—	—	—	—	—	—	3	—	3	72	Tinnevellies
5	—	—	—	—	—	—	—	—	—	5	Salems
352	7	40	2	—	—	—	11	5	65	417	Total
—	—	—	—	—	—	—	—	—	—	—	COMILLAS
11	—	—	—	—	—	—	—	—	—	11	BURMAS (Wagale and Wagyi)
6	—	5	—	—	—	—	—	—	5	11	OTHER SORTS
2,139	31	68	31	90	100	34	54	15	413	2,552	Total Indian Cotton
24	—	—	—	—	—	—	—	1	1	25	AMERICANS
62	—	5	5	—	—	—	—	—	10	72	EGYPTIANS
213	—	—	16	1	1	3	—	—	21	234	EAST AFRICANS
22	—	—	—	—	—	—	—	—	—	22	OTHERS (Sudan, Mesopotamia, etc.)
321	—	5	21	1	1	3	—	1	32	353	Total Foreign Cotton
2,460	31	63	52	91	101	37	54	16	445	2,905	GRAND TOTAL
2,228	52	51	52	72	113	37	52	20	449	2,677	Indian raw cotton consumed in mills in India. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lbs. net).

gross weight 400 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

APPENDIX XV.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936.

INDIAN CENTRAL COTTON COMMITTEE OFFICE.

1.	Secretary	Mr. P. H. Rama Reddi, M.A., B.Sc., I.A.S. ..	On deputation from Madras Department of Agriculture.
2.	Publicity Officer	Mr. R. D. Mihra, M.A., Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), Post-Grad., Res. B. Litt. (Oxon.).	——

TECHNOLOGICAL LABORATORY, BOMBAY.

3.	Director	Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), F. Inst. P.	Late Head of Science Department, Islamia College, Lahore, and Assistant Director, Technological Laboratory, Matunga, Bombay.
4.	Spinning Master	Mr. R. P. Richardson, F.T.I.	Demonstrator (Cotton Spinning), Technical College, Oldham.
5.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen. M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I. Sc., A.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
6.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
7.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Research Scholar, Technological Laboratory (Textile Physics).
8.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U.P.
9.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

10.	Junior Research Assistant	Dr. K. R. Sen, D.Sc. (Dacca)	Research Scholar, Technological Laboratory, and Technological Assistant, Lyallpur.
11.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
12.	Temporary Chemist	Dr. Lavji Thoria, Dr.Ing. (Germany) ..	——
13.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	——
14.	Spinning Assistant	Mr. N. Iyengar	——
15.	Senior Tester	Mr. H. B. Joshi, B.Sc.	——
16.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	——
17.	Junior Tester	Mr. K. G. Deo	——
18.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
19.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
20.	Junior Tester	Mr. K. V. N. Nayar	——
21.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
22.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
23.	Junior Tester	Mr. P. S. Sambamurthy	——
24.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
25.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——
26.	Junior Tester	Mr. A. J. Farid	——
27.	Junior Tester	Mr. U. K. Benegal, B.A.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*concld.*

28.	Junior Tester	Mr. P. V. Nachane, B.Sc.		——
29.	Junior Tester	Mr. C. S. Ramanathan, B.Sc.		——
30.	Junior Tester	Mr. S. N. Rao, M.Sc.		——
31.	Junior Tester	Mr. B. N. Prabhakar, B.Sc.		——
32.	Draughtsman	Mr. B. G. Mehta		——
33.	Statistical Clerk	Mr. R. Krishna Iyer		——
34.	Statistical Clerk	Mr. P. K. Wagle		——
35.	Mechanic	Mr. J. B. Kharas		——

INSTITUTE OF PLANT INDUSTRY, INDORE.

36.	Director	Mr. T. R. Low, B.Sc., (Agri.) (London), I.A.S.	Principal, Agricultural College, Cawnpore. On deputation from the United Provinces Department of Agriculture.	
37.	Geneticist and Botanist	Mr. J. B. Hutchinson, M.A. (Cantab.)	Assistant Geneticist and Botanist, Trinidad (1926-33).	
38.	Chemist and Agronomist	Mr. Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Research Student, Indian Central Cotton Committee.	
39.	Farm Superintendent	Mr. G. C. Tambe, B.Ag. (Bombay)		——
40.	Extension Officer	Mr. Kuber Singh, B.Ag. (Bombay)		——
41.	Senior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)		——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*contd.*

42.	Assistant Farm Superintendent	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
43.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow) ..	——
44.	Statistical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	——
45.	Genetical Assistant	Mr. Bholanath, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
46.	Plant Breeding Assistant	Mr. C. P. Dutt, M.Sc. (Calif.)	——
47.	Extra Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	——
48.	Botanical Assistant	Mr. P. D. Gadkari, M.Sc. (Nagpur)	King Edward Memorial Inland Research Scholar at I.P.I.
49.	Second Plant Breeding Assistant ..	Mr. M. A. A. Ansari, M.Sc. (Lucknow) ..	Research Student, Institute of Plant Industry, Indore.
50.	Chemical Assistant (Temporary) ..	Mr. R. K. Aurangabadkar, M.Sc. (Allahabad).	Do. do.
51.	Agronomical Assistant (Temporary) ..	Mr. K. N. Ambegaonkar, M.Sc. (Benares) ..	Do. do.
52.	Junior Farm Assistant (Temporary) ..	Mr. V. N. Bhargava, B.Sc. (Allahabad) ..	Do. do.
53.	Junior Farm Assistant (Temporary) ..	Mr. S. S. Gangadhar Bhotla, B.Ag. (Bombay).	——
54.	Artist	Mr. J. S. Onear	——

BOMBAY RESEARCH SCHEMES.

(*i*) *Broach Cotton Breeding Scheme.*

55.	Cotton Breeder	Mr. P. L. Patel, M.Sc. (Iowa, U.S.A.).. ..	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

Broach Cotton Breeding Scheme—contd.

56.	Botanical Assistant	Mr. B. J. Thakar, B.Ag.	On deputation from Bombay Department of Agriculture.	
57.	Pathological Assistant	Mr. Y. S. Kulkarni, B.Ag. (Bombay) ..	——	

(*ii*) *Jalgaon Cotton Breeding Scheme.*

58.	Botanical Assistant	Mr. V. L. Bhosekar, B.Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.	
59.	Pathological Assistant	Mr. J. D. Ranadive, B.Ag. (Bombay) ..	Research Student, Indian Central Cotton Committee.	

BOMBAY SEED DISTRIBUTION SCHEMES.

(*i*) *Surat Scheme.*

60.	Cotton Assistant	Mr. V. D. Desai	On deputation from Bombay Department of Agriculture.	
61.	Cotton Assistant	Mr. V. V. Patel, B.Ag. (Bombay)	Do.	do.

(*ii*) *Khandesh (Banilla) Scheme.*

62.	Cotton Superintendent, Amalner ..	Mr. S. V. Shevde, L.Ag.	On deputation from Bombay Department of Agriculture.	
63.	Agricultural Overseer	Mr. R. B. Nimbalkar, B.Ag. (Bombay) ..	Do.	do.
64.	Superintendent, Bhadgaon Farm ..	Mr. D. M. Kulkarni, B.Ag. (Bombay) ..	Do.	do.

(*iii*) *B. D.* 8 *Scheme.*

65.	Agricultural Overseer	Mr. D. A. Dave, B.Ag.	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES—*contd.*

(*iv*) *Jayawant Scheme.*

66.	Agricultural Overseer	Mr. B. S. Tadsur, B.Ag. (Bombay)	——
67.	Agricultural Overseer	Mr. B. M. Dhumma, B.Ag. ((Bombay) ..	——
68.	Agricultural Overseer	Mr. D. V. Hiremath, B.Ag. (Bombay) ..	——
69.	Agricultural Overseer	Mr. S. M. Teppashtti, B.Ag. (Bombay) ..	——
70.	Agricultural Overseer	Mr. V. H. Halgali, B.Ag. (Bombay)	——

(*v*) *Gadag No.* 1 *Scheme.*

71.	Agricultural Overseer	Mr. B. S. Patil, B.Ag. (Bombay)	——

BOMBAY COTTON FORECAST IMPROVEMENT SCHEME.

72.	Provincial Officer	Mr. G. R. Ambekar, School Final	On deputation from Bombay Department of Agriculture.

SIND PHYSIOLOGICAL RESEARCH SCHEME.

73.	Cotton Physiologist, Sakrand	Mr. B. M. Dabral, M.Sc. (Benares)	——
74.	Senior Assistant	Dr. A. M. Shaikh, M.Sc. (Bombay), Ph.D. (London), D.I.C., A.I.C.	——
75.	Junior Assistant	Mr. Rustom M. Ranji, Dip. Ag. (Bombay) ..	——
76.	Junior Assistant	Mr. H. W. Mughal, Dip. Ag. (Bombay) ..	On deputation from Bombay Department of Agriculture.
77.	Junior Assistant	Mr. T. J. Malkani, M.Sc. (with distinction) (Bombay).	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

SIND SEED DISTRIBUTION SCHEME.

78.	Statistical Assistant	Mr. S. S. Chiney, B.Sc. (Agra)	——	
79.	Cotton Supervisor, Indus Left Bank, Mirpurkhas.	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture.	
80.	Cotton Supervisor, Indus Right Bank, Dadu.	Mr. W. P. Shahani, B.Ag. (Bombay)	On deputation from Sind Department of Agriculture.	
81.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Agha Khan Mahomed, 2 years' Lyallpur Course.	Do.	do.
82.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. R. Arain, B.Ag. (Bombay), C.H.D. (Manchester).	Do.	do.
83.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj	Do.	do.
84.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani	——	
85.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Gulshah Umarshah	On deputation from Sind Department of Agriculture.	
86.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Premsing T. Advani	——	
87.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. S. A. Sidiki, Dip. Agri. (Bombay) ..	——	
88.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. K. S. Tharumal	On deputation from Sind Department of Agriculture.	
89.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. T. T. Naraindas	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

SIND SEED DISTRIBUTION SCHEME—*contd.*

90.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Jote. D. Advani, B.Ag. (Bombay)	On deputation from Sind Department of Agriculture.	
91.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Lachmandas	——	
92.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. G. Pirzada, B.Ag. (Bombay)	On deputation from Sind Department of Agriculture.	
93.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. H. N. Bolina, B.Ag. (Bombay)	——	

CENTRAL PROVINCES RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

94.	Economic Botanist for Cotton	Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture.	
95.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post-Graduate, Pusa.	Do.	do.
96.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.	
97.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.	
98.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do.	do.
99.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do.	do.
100.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc.	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

CENTRAL PROVINCES RESEARCH SCHEMES—*contd.*

(*ii*) *Entomological Scheme.*

101.	Agricultural Assistant	Mr. M. S. Patel, B.Ag.	——

COMBINED LONG-STAPLE COTTON AND MARKETING OF VERUM COTTON SCHEMES IN C. P. AND BERAR.

102.	Agricultural Assistant	Mr. J. P. Tiwari, B.Ag.	——
103.	Agricultural Assistant	Mr. L. P. Khare, B.Ag.	——
104.	Agricultural Assistant	Mr. G. N. Wardadkar, B.Ag.	——
105.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
106.	Agricultural Assistant	Mr. N. B. Chincholkar, B.Ag.	——
107.	Agricultural Assistant	Mr. J. N. Kelkar, B.Ag.	——
108.	Agricultural Assistant	Mr. G. C. Tiwari, Certificate Course of Agricultural College, Nagpur.	——
109.	Agricultural Assistant	Mr. W. R. Patwardhan, B.Ag.	——
110.	Agricultural Assistant	Mr. M. D. Anadeo, B.Ag.	——
111.	Agricultural Assistant	Mr. Rafat Ali Haqqani, B.Ag.	——
112.	Agricultural Assistant	Mr. K. Sheoramsingh Chowhan, B.Ag. ..	——
113.	Agricultural Assistant	Mr. R. S. Shiwalkar, B.Ag.	——
114.	Agricultural Assistant	Mr. V. S. Hingankar, B.Ag.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

MADRAS RESEARCH SCHEMES.

(*i*) *Herbaceum Scheme.*

115.	Gazetted Assistant	Mr. R. Balasubramania Ayyar, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.	
116.	Junior Assistant	Mr. G. Seshadri Ayyangar, M.A.	——	
117.	Junior Assistant	Mr. V. Ramaswami Mudaliar, B.A.	——	
118.	Sub-Assistant	Mr. D. Devasirvatham, S.S.L.C. (Botany) (Intermediate).	On deputation from Madras Department of Agriculture.	

(*ii*) *Pempheres and Physiological Scheme.*

119.	Bio-Chemist	Dr. S. Kasinatha Ayyar, B.A., Ph.D. (London.)	On deputation from Madras Department of Agriculture.	
120.	Physiological Botanist	Mr. T. R. Narayana Ayyar, B.A. (Cantab.), B.Sc. (Ag.).	Do.	do.
121.	Parasitologist	Mr. P. N. Krishna Ayyar, B.A.	Do.	do.
122.	Assistant Botanist	Mr. K. Dharma Rajulu, M.Sc. (Bombay.) ..	Research Student, Indian Central Cotton Committee.	
123.	Assistant Entomologist	Mr. V. Margabandu, M.A.	On deputation from Madras Department of Agriculture.	
124.	Assistant Botanist	Mr. N. C. Narayanan, B.Sc. (Ag.)	——	
125.	Assistant Entomologist	Mr. P. S. Narayanaswami, B.Sc. (Ag.). ..	On deputation from Madras Department of Agriculture.	
126.	Assistant Chemist	Mr. K. Saptharishi, B.Sc. (Ag.).	——	
127.	Assistant Botanist	Mr. S. Anantham, B.Sc. (Ag.).	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

MADRAS RESEARCH SCHEMES—*contd.*

(iii) Fodder Cholam Scheme.

128.	Assistant	Mr. M. R. Balakrishnan, B.A., B.Sc. (Agri.).. .	On deputation from Madras Department of Agriculture.	
129.	Assistant	Mr. S. Sundaram, B.A., B.Sc. (Agri.) ..	Do.	do.

(iv) Breeding of Nadam Cotton.

130.	Assistant	Mr. R. Krishnamurthi, B.Sc. (Ag.)	Do.	do.

MADRAS SEED DISTRIBUTION SCHEMES.

(i) Pay and Allowance of Business Manager.

131.	Business Manager, Tiruppur Co-operative Trading Society, Ltd. ..	Mr. K. Avudanayakam Pillai, S.S.L.C., L.Ag.	On deputation from Madras Department of Agriculture.

(ii) Co. 2 Scheme.

132.	Agricultural Demonstrator	Mr. Damodara Prabhu, B.Sc. (Agri.) ..	Do.	do.
133.	Agricultural Demonstrator	Mr. L. Krishnan, B.A., B.Sc. (Agri.)	Do.	do.
134.	Agricultural Demonstrator	Mr. P. P. Syed Mohamed, B.Sc. (Agri.) ..	Do.	do.
135.	Agricultural Demonstrator	Mr. P. N. Muthuswami, B.Sc. (Agri.).. ..	Do.	do.
136.	Agricultural Demonstrator	Mr. K. Narayana Nayar, B.Sc. (Agri.) ..	Do.	do.

PUNJAB RESEARCH SCHEMES.

(i) Botanical Scheme.

137.	Cotton Research Botanist	Mr. Mohd. Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee, and State Research Scholar. On deputation from Punjab Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*i*) *Botanical Scheme*—contd.

138.	Assistant to Cotton Research Botanist .	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.	
139.	Agricultural Assistant	Bh. Sarup Singh, L.Ag., M.Sc. (Texas), U.S.A.	Do.	do.
140.	Agricultural Assistant	Th. Ranbir Singh, B.Sc. (Agri.)	Do.	do.
141.	Agricultural Assistant	S. Kehr Singh, B.Sc. (Agri.)	Do.	do.
142.	Agricultural Assistant	Bh. Autar Singh, B.Sc. (Agri.)	——	
143.	Agricultural Assistant	Bh. Santokh Singh, B.Sc. (Agri.)	On deputation from Punjab Department of Agriculture.	
144.	Agricultural Assistant	S. Fateh Ali Shah, B.Sc. (Agri.)	Do.	do.
145.	Agricultural Assistant	Ch. Kanshi Ram, B.Sc. (Agri.) Gold Medalist.	——	
146.	Agricultural Assistant (B Class) . .	Mr. S. E. Danial, L. C. (Course)	On deputation from Punjab Department of Agriculture.	
147.	Technical Assistant	Ch. Mohammad Rashid Khan, L.C. Course, Munshi Fazil, F.A. (Punjab University).	Do.	do.
148.	Statistical Assistant	Mr. Bhagat Ram Sehgal, M.A. (Punjab) . .	——	

(*ii*) *Entomological (Pink and Spotted Boll-worm) Scheme.*

149.	Assistant Cotton Entomologist . .	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*ii*) *Entomological* (*Pink and Spotted Boll-worm*) *Scheme*—contd.

150.	Field Assistant Research Work ..	Mr. Ladha Ram, B.Sc.	——	
151.	Field Assistant Research Work ..	L. Ganda Ram, B.Sc., F.E.L.	——	
152.	Field Assistant Research Work ..	Mr. Piare Mohan, B.Sc. (Hons.), M.Sc. ..	——	
153.	Field Assistant Research Work ..	Mr. Manzoor Abbas, B.Sc. (Agri.)	——	
154.	Field Assistant Research Work ..	Mr. Ghulam Ullah, B.Sc. (Agri.)	——	
155.	Research Assistant	Mr. Abdul Ghani, B.Sc. (Agri.)	——	
156.	Research Assistant	Mr. Dharm Bir Kohli, B.Sc. (Agri.)	——	

(*iii*) *White Fly Scheme.*

157.	Assistant Cotton Entomologist ..	L. Kedar Nath Trehan, M.Sc. (Punjab) ..	Research Student, Indian Central Cotton Committee.	
158.	Field Assistant	Mr. Hari Chand, B.Sc. (Agri.)..	——	

(*iv*) *Root Rot Scheme.*

159.	Assistant Cotton Mycologist	Dr. R. S. Vasudeva, B.Sc., Ph.D. (London), D.I.C. (London).	——	
160.	Agricultural Assistant	Mr. Mohd. Ashraf, B.Sc. (Agri.)	——	
161.	Agricultural Assistant	Ch. Mohd. Rafiq, M.Sc. (Hons.)	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

PUNJAB RESEARCH SCHEMES—*concld.*

(*v*) *Physiological (Periodic Partial Failure) Scheme.*

162.	Plant Physiologist	Prof. R. H. Dastur, M.Sc., F.L.S.	On deputation from Bombay Educational Department.
163.	Assistant Physiologist and Microscopist	Dr. S. S. Verma, M.Sc. (Benares), Ph.D. (London), D.I.C.	——
164.	Bio-Chemist	Dr. K. M. Samant, M.Sc., Ph.D.	——
165.	Chemical Assistant	Mr. A. A. Ahad, B.Sc. (Agri.)	——
166.	Physiological Assistant	Bh. Sucha Singh, B.Sc. (Agri.)	——
167.	Statistical Assistant	Mr. Kanwar Kishan, M.A. (Punjab)	——
168.	Field Assistant	Bh. Mukhtar Singh, B.Sc. (Agri.)	——

UNITED PROVINCES, ROHILKHAND AND BUNDELKHAND SURVEY SCHEME.

169.	Agricultural Inspector	Mr. Attar Sing, L.Ag. (Cawnpore)	On deputation from the United Provinces Department of Agriculture.

HYDERABAD RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

170.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab)..	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
171.	Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona)..	On deputation from Bombay Department of Agriculture.
172.	Assistant Cotton Research Botanist ..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.
173.	Inspector, Variety Testing Stations ..	Mr. N. R. Yardi, B.Ag. (Bombay)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*contd.*

HYDERABAD RESEARCH SCHEMES—*contd.*

(*ii*) *Hyderabad (Pink and Spotted Boll-worm) Scheme.*

174.	Cotton Entomologist	Mr. H. D. Nangpal, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee and Assistant Entomologist, United Provinces Pink Boll-worm Scheme.
175.	Senior Research Assistant	Mr. N. T. Nadkarny, B.Ag. (Bombay), Post-Graduate Course in Entomology at Poona Agricultural College.	——
176.	Junior Research Assistant	Mr. T. E. Krishnaswamy, B.Sc. (Agri.) (Coimbatore).	——

HYDERABAD SEED DISTRIBUTION SCHEME.

177.	Inspector	Mr. M. V. Chitnis	——

BARODA RESEARCH SCHEMES.

(*i*) *Root Rot Scheme.*

178.	Cotton Breeder	Mr. M. S. Pandya, B.Ag. (Bombay), B.Sc. ..	On deputation from Bombay Department of Agriculture.
179.	Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	——
180.	Mycological Assistant	Mr. G. H. Desai, B.Ag. (Bombay)	——
181.	Field Assistant	Mr. V. G. Kulkarni	——
182.	Field Assistant	Mr. M. C. Patel	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1936—*concld.*

BARODA RESEARCH SCHEMES—*contd.*

(*ii*) *Plant Puller Propaganda Scheme.*

183.	Plant Puller Officer	Mr. K. M. Desai, B.Ag.	——	
184.	Plant Puller Propagandist	Mr. R. S. Patel	——	

BIKANER GANG CANAL SCHEME.

185.	Cotton Assistant	Mr. Arjan Singh, B.Sc.	——	

BENGAL COMILLA COTTON SCHEME.

186.	Cotton Research Officer	Mr. H. K. Majumdar, M.Sc.	——	

MYSORE (DODDAHATHI) SCHEME.

187.	Junior Assistant Botanist	Mr. K. Gopala Iyengar, M.Sc. (Bombay) ..	——	
188.	Field Assistant	Mr. G. Srinivasa Iyengar, M.Sc. (Mysore) ..	——	

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

189.	Under Cotton Specialist, Coimbatore ..	Mr. R. L. N. Iyengar, B.Sc.	Research Student, Indian Central Cotton Committee.	
190.	Under Cotton Breeder, Dharwar ..	Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.	
191.	Under Cotton Research Botanist, Lyallpur.	Mr. S. Raja Raman, B.A. (Madras), M.Sc. (Benares).	——	
192.	Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Research Student, Indian Central Cotton Committee.	
193.	Under Botanist, Agricultural Research Station, Sakrand.	Mr. K. S. Marar, B.A., LL.B.	Formerly Junior Tester at Technological Laboratory, Bombay.	

APPENDIX XVI.

RESEARCH STUDENTSHIPS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammed Afzal, B.Sc. (Punjab).	Do. ..	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Do.
,,	Jiwan Singh, M.Sc. (Punjab).	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

RESEARCH STUDENTSHIPS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Sind Agricultural Department, Cotton Breeder, Sind, Mirpurkhas.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangpal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	Entomologist, Hyderabad Pink and Spotted Boll-worm Scheme, Parbhani.	Late Special Research Assistant, Pink Boll-worm Investigation, United Provinces.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology..	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph. D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding.)	Punjab Agricultural Department, Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

4

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology.	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	....	Technological Assistant, Dharwar, up to 31st July 1929. Went abroad for further study.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee. Obtained a Doctorate (D.Sc.) in 1934.
,,	L. N. Rao, M.Sc. (Calcutta)..	Do. ..	Cotton Microscopy. .	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay), M.Sc. (Tech.), (Manchester).	Do. ..	Cotton Technology .	Head of the Textile Manufactures Department, Victoria Jubilee Technical Institute, Bombay.	Late Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.

RESEARCH STUDENTSHIPS—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	Ram Saran Koshal, M.Sc. (Punjab).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology ..	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	Awarded a Training Grant for foreign study in 1933.
,,	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
7 ,,	Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Coimbatore.. ..	Cotton Bio-chemistry.	Chemist and Agronomist, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Sind Agricultural Department, Cotton Supervisor, Indus Right Bank, Sind Seed Distribution Scheme, Dadu.	Do.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Assistant Farm Superintendent, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, B.Sc. (Mysore).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Technological Assistant, Coimbatore.	Do.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Secured Government Scholarship for study abroad and obtained Ph. D. (Cantab).

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1927	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Cotton Entomology.	Assist. Professor of Zoology and Entomology, Agricultural College, Cawnpore.	Obtained Doctorate at Edinburgh.
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University)	Institute of Plant Industry, Indore.	Cotton Physiology..	Unemployed.	....
,,	Sant Singh Verma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	....	Awarded a Foreign Scholarship by the Indian Central Cotton Committee. Obtained Ph. D. (Lond.)
9 ,,	Lakshmi Narayan Mathur, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore. ..	Do. ..	Unemployed.	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy .	Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab), M.Sc.	Cawnpore	Cotton Entomology	Field Assistant, Parasite Work, Pink and Spotted Boll-worm Scheme, Punjab.	Do.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Sind Agricultural Department, Inspector of Agriculture, Eastern Nara Circle, Mirpurkhas.	....
5 ,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (University of Edin.)	Institute of Plant Industry, Indore .	Do. ..	Madras Agricultural Service.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

RESEARCH STUDENTSHIPS—*contd.*

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
	1929	Sringabhushana, B.Sc. ..	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Technological Assistant, Surat.	Indian Central Cotton Committee.
3	,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
	,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do.	Do. ..	Do. ..	....
	1930	Madan Lal Bhatia, M.Sc. (Punjab).	Do.	Entomology ..	Abroad for further study ..	....
4	,,	Bhola Nath, M.Sc. (Punjab)..	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Genetical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
	,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
	,,	Brajendra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	....	....
	1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Do. ..	....	Resigned.
4	,,	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	Dist. Supervisor, Enquiry into the cost of production of Cotton and Sugar-cane crops, Central Provinces.	....
	,,	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
	,,	Doraiswami Ayyar, B.A., B.Sc. (Agri.) (Madras).	Madras.	Do. ..	Madras Agricultural Service.	....
1	1935	Krishna Behari Lal, M.Sc. (Cal.), Ph. D. (Edinburgh).	Lyallpur	Cotton Entomology	Research Student	Under training.
2	1936	M. U. Parmar, M.Sc., (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Techonology.	Research Student. ..	Under training.
	,,	G. Rama Rau, B.Sc. (Bombay)	Do.	Do.	Do.	Do.

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
			Foreign Research Studentships.			
1	1931	Sant Singh Verma, M.Sc. (Benares Hindu University).	Imperial College of Science and Technology, London.	Plant Physiology ..	....	Completed training, July 1935. Obtained Ph.D. of London University.
			Training Grants.			
2	1933	S. N. Venkataramanan, B.A., B.Sc. (Agri.) (Madras).	Calcutta	Cotton Statistics ..	Madras Agricultural Service	....
2	,,	C. Jagannatha Rao, B.A. (Madras).	....	Cotton Physiology	Research Student	Under training.
1	1936	P. Abraham, B.A. (Madras)..	....	Cotton Cytology ..	Not yet joined ..	....
			Foreign Training Grants.			
2	1933	M. Taskhir Ahmad, B.Sc. (Agri.) (Punjab).	Trinity College, Cambridge.	Entomology ..	Assistant Entomologist, Imperial Institute of Agricultural Research, Pusa.	....
2	,,	G. B. Patel, B. Ag. (Bombay).	University of California, U.S.A.	Cotton Breeding ..	Research Student	Completed training July 1936. Obtained M.Sc. of California University.
2	1934	M. A. Shama Iyengar, B.Ag. (Bombay).	Tour in Hungary, England and Egypt.	Study of Kalar (alkali) lands and cultivation of superior Egyptian cottons with special reference to soil and environmental conditions.	Sind Agricultural Department. Senior Assistant to Agricultural Chemist and Soil Physicist.	....
2	,,	Nazir Ahmad, M.Sc. (Punjab).	Imperial College of Science and Technology, London.	Entomology ..	Research Student	Under training.
1	1936	Kidar Nath Trehan, M.Sc. (Punjab.)	....	Applied Entomology	Not yet joined	....

" Indian Central Cotton Committee " in the remarks column indicates a post paid for from one of the Committee's Research Grants.

ANNUAL REPORT

OF THE

INDIAN CENTRAL COTTON COMMITTEE,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST

1937.

BOMBAY:
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With the Secretary's Compliments.

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Ballard Estate,
Fort, Bombay.

ANNUAL REPORT

OF THE

INDIAN CENTRAL COTTON COMMITTEE,

BOMBAY,

FOR THE

YEAR ENDING 31st AUGUST

1937.

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Annual Report of the Indian Central Cotton Committee for the year ending 31st August 1937.

CHAPTER I.

THE Indian Central Cotton Committee was constituted by the Government of India in the Department of Revenue and Agriculture, in their Resolution No. 404-22, dated the 31st March 1921, as a result of one of the recommendations of the Indian Cotton Committee of 1917-18. Originally it was purely an advisory body, but with its incorporation under the Indian Cotton Cess Act in 1923, the Committee became an administrative body having at its disposal funds "for the improvement and development of the growing, marketing and manufacture of cotton in India." The Committee thus fulfils two main functions. Firstly, it advises the Government of India, Provincial Governments and Indian States on matters connected with the growing and marketing of cotton and brings to their notice matters, which, in its opinion, require attention. Secondly, it provides funds for research into cotton problems of an all-India importance or for large areas where cotton is an important crop, and for the extension and marketing of improved varieties of cotton. The research portion of the Committee's work has passed the experimental stage, as will be seen in Chapters IV and V of this report.

The Committee also serves as a common meeting-ground for all branches of the cotton industry, since all the main interests associated with cotton, viz., the grower, the ginner and the exporter, the millowner and the agricultural expert are represented on it. Whilst the Committee's constitution thus ensures a broad outlook on the many problems affecting the cotton industry, its primary concern is the interest and welfare of the cotton grower.

PERSONNEL.

2. In *Appendix I* will be found a list of members of the Committee as it stood on the 31st August 1937. Under the Indian Cotton Cess Rules, members, who are not *ex-officio* members, hold office for three years and one-third of their number retire each year in rotation. The term of office of additional members appointed by the Governor-General-in-Council under Section 4 (xi) of the Indian Cotton Cess Act is three years or such lesser period as may be specified in the Notification of appointment.

SUB-COMMITTEES.

3. Most of the detailed work of the Committee is carried on through Sub-Committees and this saves a considerable time and lightens the task of the Committee at its half-yearly meetings. The Committee is greatly indebted to the members of the various Sub-Committees for their invaluable assistance and willing co-operation in furthering the work of the Committee ; more particularly are its thanks due to the members of the Standing Finance and Local Sub-Committees who are required to attend to the business of the Committee at more frequent intervals.

The functions of the various Sub-Committees are detailed below and their composition as on the 31st August 1937 is given in *Appendix II.*

(*a*) *The Standing Finance Sub-Committee* is a Statutory Sub-Committee and is the principal executive body of the Committee. By a resolution of the Committee one of the members of this Sub-Committee must be a representative of cotton growers. Seven meetings of this Sub-Committee were held during the past year.

(*b*) *The Local Sub-Committee* deals with all matters of a general nature, not involving finance, which cannot be postponed for consideration to the half-yearly meetings of the full Committee. Six meetings of this Sub-Committee were held during the year. A special meeting of this Sub-Committee was held on the 13th March 1937 to meet Mr. R. R. Saksena, Indian Government Trade Commissioner, Japan.

(*c*) *The Cotton Ginning and Pressing Factories Sub-Committee* is appointed by statute to attend to matters arising out of the Cotton Ginning and Pressing Factories Act of 1925. This Sub-Committee did not meet during the year under report. The more routine work of this Sub-Committee was disposed of by the Local Sub-Committee.

(*d*) *The Agricultural Research Sub-Committee* ordinarily assembles half-yearly during the meetings of the full Committee. It reports on the progress made on schemes financed by the Committee, examines proposals for new schemes or extensions of those already in operation and considers the reports of research students.

(*e*) *The Technological Research Sub-Committee,* like the Agricultural Research Sub-Committee, generally meets during the half-yearly meetings of the full Committee and deals with all matters connected with the Technological Laboratory and technological research.

(*f*) *The Research Students Selection Sub-Committee,* as its name implies, selects students to whom scholarships or training grants are awarded for the purpose of undergoing training in research in the several sciences relating to cotton. One meeting of this Sub-Committee took place during the year.

(*g*) *The Cotton Forecast Improvement Sub-Committee* usually meets half-yearly, its principal business being the improvement of the cotton forecasts of India.

(*h*) *The Wider Markets Sub-Committee* was appointed in 1933 with the object of examining the possibilities of finding wider markets for Indian cotton. It met twice during the year under report.

(*i*) *The Standards Sub-Committee* was constituted in April 1933, and is concerned with the preparation, for use in India, of universal standards of certain growths of cotton dealt with in common both by the East India Cotton Association, Bombay, and the Karachi Cotton Association and of certain other varieties with which only the former Association is concerned. Five meetings of this Sub-Committee were held during the year.

In addition to the above-mentioned Standing Sub-Committees, special Sub-Committees are appointed from time to time to deal with specific matters which do not fall within the purview of any of the other Sub-Committees. One such Sub-Committee met on the 26th February 1937 to consider the policy to be adopted regarding the apportionment of the cost of schemes financed by the Committee during their extension period between Provincial Governments, Indian States and the Committee. Its recommendations as finally amended and approved by the Committee will be found in *Appendix III*.

4. Whilst the Committee is representative of practically all sections of the cotton industry in India, it also enjoys the privilege of deputing representatives to serve on other bodies. Thus Sardar Rao Bahadur Bhimbhai Ranchodji Naik represents the Committee on the Imperial Council of Agricultural Research. Mian Nurullah, Mr. M. P. Kolhe and Sardar Rao Bahadur Bhimbhai Ranchodji Naik represented the Committee on the Board of Directors of the East India Cotton Association. On the Joint Sub-Committee of the Imperial Council of Agricultural Research and of the Indian Central Cotton Committee in connection with the investigation into the cost of growing cotton, sugarcane and their rotation crops, the Committee is represented by Sir Purshotamdas Thakurdas, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mr. Chunilal B. Mehta, Mr. Chimanlal B. Parikh (representing the East India Cotton Association), and the Secretary. The representatives of the Committee on the Board of Governors of the Institute of Plant Industry, Indore, are the President, Sir Purshotamdas Thakurdas, Mr. S. D. Saklatvala, Mr. G. C. R. Coleridge, Mr. Kasturbhai Lalbhai, Sir Chunilal V. Mehta, Rao Bahadur Sir Madhaorao Deshpande, Sardar Rao Bahadur Bhimbhai Ranchodji Naik, Mr. J. Vonesch, Mian Nurullah and the Secretary. The Committee is an Associate Member of the International Federation of Master Cotton Spinners' and Manufacturers' Associations,

MEETINGS.

5. The Indian Central Cotton Committee held two meetings during the year under review, both at Bombay. The first meeting took place on the 2nd and 3rd March 1937, and the following were among those who attended it by invitation :—

Mr. V. C. Steer-Webster, Technical Adviser, Cutch State ; Mr. F. J. D'Eath, Port Commissioner, Veraval, Junagadh State and Mr. S. A. S. Quraeshi, Chief Customs Officer, Nawanagar State.

The second meeting which was presided over by Mr. N. C. Mehta, I.C.S., Offg. Vice-Chairman, Imperial Council of Agricultural Research, was held on the 9th and 10th August 1937. One of the visitors present was Mr. E. F. G. Gilmore, Offg. Director, Industrial Research Bureau, Indian Stores Department.

In August 1935 the Committee resolved that a Conference of Scientific Research Workers on Cotton in India should be held once every three years to discuss cotton problems and in pursuance of this decision the first of such Conferences was held in Bombay on the 4th, 5th and 6th March 1937. The Conference was presided over by Sir Bryce Burt, C.I.E., Offg. Vice-Chairman of the Imperial Council of Agricultural Research and President of the Committee on the first day, and by Dr. W. Burns, Offg. Agricultural Expert, Imperial Council of Agricultural Research, on the second and third days. The proceedings of the Conference together with the scientific papers discussed have been printed as a separate publication of the Committee.

A list of the more important resolutions passed at the meetings of the Committee mentioned above and at the Conference of Scientific Research Workers on Cotton in India will be found in *Appendix IV*.

STAFF.

6. Mr. P. H. Rama Reddi continued as Secretary of the Committee till the afternoon of the 12th August 1937 from which date his services were replaced at the disposal of the Government of Madras for appointment as Director of Agriculture. Pending the appointment of Mr. Rama Reddi's successor, Mr. C. J. Bocarro, the Assistant Secretary, discharged the current duties of the office of the Secretary in addition to his own duties until the 4th October 1937 when Mr. D. N. Mahta, Economic Botanist to Government, Central Provinces and Berar, assumed charge as Secretary of the Committee.

Mr. C. J. Bocarro held the post of Assistant Secretary throughout the year under report.

Dr. Nazir Ahmad continued as Director of the Technological Laboratory and Mr. R. D. Mihra as Publicity Officer throughout the year.

PROVINCIAL COTTON COMMITTEES.

7. The value of Provincial Cotton Committees in dealing with problems of provincial importance has been stressed in previous reports, and once more the Committee records its view that where such Committees are actively functioning the work done by them has materially assisted the Committee in arriving at decisions on subjects referred to it. Local problems can be visualised best from various aspects by Provincial Committees and therefore the discussions and the decisions of such Committees help to bridge over difficulties which the absence of the knowledge of local conditions unavoidably creates. During the year under review, the Sind Cotton Committee met twice and the Punjab and the Central Provinces Cotton Committees each met once, and much useful work was transacted by them. During the year under report the Indore Government accepted the Committee's suggestion and appointed a representative Committee called "The Holkar State Cotton Committee" with the Finance Member of the State as Chairman. It is hoped that the coming years will witness a revival of the activities of Provincial Cotton Committees.

CHAPTER II.

WORK OF THE YEAR.

Cotton Policy.

8. The policy of the Committee in actively encouraging the extension of the area under long and medium staple cotton in India has met with considerable success as will be evidenced by the fact that cotton of staple length "$\frac{7}{8}$ inch and above" formed no less than 33 per cent. of the toal production in India in 1936-37 against 31 per cent. in 1935-36 and 23 per cent. in 1930-31. The year under report saw the inauguration of a scheme for the extension of *Jarila* cotton, a medium staple wilt-resistant strain, in the whole of the Khandesh tract where at present only the short staple type is grown and for which the demand is mainly confined to Japan. Work on the improvement of the Dholleras crop was also started this year. The *Mungari* cotton scheme sanctioned during the year has for its object the improvement of the short staple *Mungari* cotton grown in the medium staple Northerns and Westerns tract of the Madras Presidency to eliminate the possibility of the short staple cotton being mixed with the superior cotton of the tract which is already protected by the Cotton Transport Act against the influx of inferior cotton from outside.

CENTRAL PROVINCES COTTON CONTROL ACT.

9. In August 1935 the Indian Central Cotton Committee endorsed the resolution of the Central Provinces Provincial Cotton Committee recommending legislative action for the elimination, from the Central Provinces and Berar, of *Garrow-Hill* cotton, a very inferior, coarse but prolific variety, which threatened to mar the reputation of the Central Provinces cottons. The recommendation was accepted by the Central Provinces Government and a Bill prohibiting the cultivation of *Garrow-Hill* cotton in the Central Provinces and Berar was introduced in the Provincial Council in February 1936 and passed into law towards the end of that year. The Act, known as the "Central Provinces Cotton Control Act," came into force on the 1st March 1937 and the question of framing rules under it is now engaging the attention of the Provincial Government. A copy of the Act will be found in *Appendix V*.

BOMBAY COTTON CONTROL ACT.

10. The Bombay Cotton Control Act which was passed in November 1935 has for its object the prohibition of the cultivation, mixing or possession of *Goghari*, an inferior type of cotton, which was rapidly spreading in the Surat tract and threatened to lower the reputation of 1027 *A.L.F.* to the

detriment of the cotton growers of that tract. As a result of the application of the Act and the launching of a vigorous propaganda against *Goghari* by the Bombay Agricultural Department the cultivation of *Goghari* has been almost completely eliminated in the areas in which it was met with extensively in the past. In consequence Navsari cotton in the season under review realised Rs. 10 on Bardoli and Surat, a big contrast with past years when it was sold either on par or at " off " prices. The staff of the Agricultural Department frequently inspected the ginning factories and carts of seed cotton brought for delivery and there is little doubt that these measures produced a salutary effect on both the merchant and the grower. Advantage was also taken of the Agricultural Shows organised by the Village Uplift Committee at Bardoli, Jalalpore and Surat Farm to explain to the cultivators the objects of the Cotton Control Act and the dangers of sowing *Goghari*.

BARODA COTTON CONTROL ACT.

11. It was observed in last year's report that the Bombay Cotton Control Act of 1935 was, by notification of the Baroda State, dated the 25th April 1936, applied to the State with certain modifications and omissions to meet the requirements of the State. During the year, propaganda was also carried on by the Baroda Agricultural Department by means of posters, handbills, meetings of farmers and conferences of leading *Kheduts* to secure the objects of the Act. Leaflets were also published explaining the purport and scope of the Act and farmers were warned against the use of the inferior seed. Arrangements were also made for the supply of pure seed by the establishment of seed depôts at eight different centres in the State. By this means 400 cartloads of pure superior seed were sold to farmers. On the whole the Act is reported to have worked smoothly and well.

BHOPAL COTTON CONTROL BILL.

12. During the year the Bhopal Durbar also introduced a Cotton Control Bill which follows the Bombay Cotton Control Act and has for its object the promotion of the cultivation of superior cottons by the prohibition of the growing of inferior cottons in the State. The Bill contains provision for its application to the whole State or to certain parts only by notification of the Durbar.

LANCASHIRE INDIAN COTTON COMMITTEE.

13. The Committee once again expressed its appreciation of the work done by the Lancashire Indian Cotton Committee as detailed in its Annual Report for the year ending 31st December 1936. It was suggested in this connection that information should be obtained from the Lancashire Indian Cotton Committee regarding the percentage figures for Indian cotton consumed in Lancashire in comparison with the total quantity of cotton consumed from year to year, and also the proportions in which different varieties of Indian cottons were used.

To quote from the report, "the imports of Indian cotton into the United Kingdom during the cotton year, which ended on 31st July 1936, amounted to 546,654 bales. At this figure the imports are higher than the most optimistic observers would have believed to be possible of attainment three or four years ago. That the takings of Indian cotton by the United Kingdom should have passed the " half million bales " mark by such a satisfactory margin, notwithstanding the operation of certain adverse factors, is by far the most significant of the events with which this report will deal "..... "Shipments since the end of last cotton year, which will be included in next year's statistics, show a further improvement and thus demonstrate that the success of 1936 is no mere 'flash-in-the-pan.' An important part of the work of the Lancashire Indian Cotton Committee was that connected with technical investigations of Indian cottons, the object being to convince Lancashire spinners that Indian cotton could be processed with technical success for the demand they had to meet.

The following figures indicate the progress made in the use of Indian cotton in Great Britain :—

Year (August 1st to July 31st.)	Lancashire Indian Cotton Committee.	Liverpool Cotton Association	Department of Commercial Intelligence and Statistics, Calcutta. *Thousands of bales of 400 lbs.*	
	Millions of lbs. (Consumption.)	*Thousands of bales (Running)* (Imports into United Kingdom,)	Exports to United Kingdom.	*Total Exports to all countries.
1928-29	72	228	233	3,933
1929-30	73	291	286	3,868
1930-31	98	281	274	3,729
1931-32	72	137	128	1,592
1932-33	49	230	257	2,868
1933-34	92	362	367	3,270
1934-35	133	394	374	3,115
1935-36	150	547	533	3,826
1936-37	Figures not available.	658	565	4,267†

* From 1931-32 exports from Kathiawar Ports are included.

† Excludes exports from Burma.

COTTON TRANSPORT ACT.

14. At the request of the Indian Central Cotton Committee, the Government of India passed, in 1923, the Cotton Transport Act, which enables the Provincial Governments to prohibit within their jurisdiction the import, for

purposes of mixing and substitution, of inferior cotton into areas growing superior varieties. The extent of the application of the Act in those Provinces in which it has been introduced is detailed below :—

Madras.—During the year the southern limit of the Northerns and Westerns area was shifted from Settigunta to Razampetta Railway Station, a distance of 37 miles in the interior. It is hoped that this extension of the distance over which cotton from the Northerns and Westerns tract will have to be transported by road will help to stop the illicit movement of cotton into the Southerns tract.

Bombay.—The seven protected areas notified in the Bombay Presidency remained unchanged during the year under report. The question of amending the Bombay Notification under the Cotton Transport Act to enable half-pressed bales from Vyara and some other stations in Baroda State territory to be imported into the corresponding Surat protected area in British territory without a license is now under the consideration of the Bombay Government. At present owing to a legal difficulty arising from the fact that the respective corresponding protected areas have been notified under different Cotton Transport Acts, unrestricted transport of cotton between the protected areas concerned is not permissible.

Central Provinces.—During the year the old district of Seoni was deleted from the protected area on its absorption into the Hoshangabad district, and the Narsinghpur sub-division of the Hoshangabad district was included in the protected area. The railway route along which cotton transportation is prohibited, except under license, was extended from Piparia to Bankheri.

Indian States.—The stations of Kaher, Vyara, Doswada and Fort Songhad on the Tapti Valley Railway were included during the year in the schedule of railway stations under the Baroda Cotton Transport Act.

There was no change in the protected area in the Hyderabad, Sangli, Rajpipla, Chhota Udepur, Baria and Lunawada States.

The Bhaderwa, Kadana, Sant, Sanjeli and Jambughoda States issued notifications during the year under review, declaring the portions of the Nerbudda-Mahi protected zone lying within their respective territories to be a " protected area ". There are no railway stations within the territories of these States.

The protected area in the Indore State remained unchanged. The Holkar Durbar are now going into the question of amplifying the Act wherever possible. A Committee was appointed to make recommendations to this end in collaboration with the Institute of Plant Industry, Indore, and the Indian Central Cotton Committee. The recommendations are now under consideration.

COTTON GINNING AND PRESSING FACTORIES ACT.

15. During the year under report several cases of infringement of the Act were brought to the notice of the authorities concerned. In some cases the press marks were put on the wrong side or they were indecipherable; in one case they were entirely absent. There were two instances in which the factory owners were fined Rs. 25 each, while in other minor cases they were warned.

Most of the cotton producing Indian States have fallen into line with British India in legislating for the marking of bales and the submission of weekly returns of cotton pressed. During the year, the Bansda and Balasinor States introduced similar legislation, thus bringing the total to 69. Out of these, weekly press returns were received from 64; the presses in the remaining States did not work during the season.

Amendment of the Act.

(a) The Director of Agriculture, Punjab, brought to the notice of the Committee that in certain cotton ginning and pressing factories in the Punjab, the construction of which was completed or commenced before the Act came into operation, additions and alterations were made which were not in accordance with the plans and specifications prescribed under Section 9(1) of the Act. The Director of Agriculture further reported that some of the owners of the factories who were prosecuted under Section 9 (1)(b) of the Act were acquitted by the trying Magistrates on the ground that the said section, as at present worded, did not apply to factories constructed before the Act was passed in 1925, an opinion which was upheld by the Legal Remembrancer to the Punjab Government. As the Committee felt that the object of the Act would be defeated if additions or alterations to factories constructed before the Act came into operation were permitted to be made, the Government of India were requested to amend Section 9(1) of the Act so as to bring within its scope also those factories which were constructed before the commencement of the Act. The matter is under the consideration of Government.

(b) As the result of a representation made by certain Bombay cotton merchants urging the repeal of Section 14 of the Cotton Ginning and Pressing Factories Act on the ground that they were being penalised under the Bye-laws of the East India Cotton Association for the negligence or errors of pressing factory owners, while the press owners themselves escaped without a penalty or liability, the Committee decided to take up with the Government of India the question of amending Section 14 in a manner that would mitigate, if not entirely remove, the difficulties. Certain proposals have been made and these are under the consideration of the Government of India.

LICENSING OF GINNING AND PRESSING FACTORIES.

16. It is satisfactory to record that one of the first pieces of legislation advocated by the Committee almost from the time of its inception has at

last found a place in the statute book of the Bombay, Central Provinces and Sind Governments. In view of the decision of the Government of India not to undertake legislation themselves for the licensing of ginning and pressing factories but to leave it to local Governments to do so if they desired, Provincial Governments were addressed and the three Provincial Governments mentioned have passed the required legislation making it obligatory on all cotton ginning and pressing factories, situated in areas to which the Act may be applied, to take out licenses, and prohibiting the watering, mixing or admixture of cotton. These measures, when given effect to, will go a long way towards suppressing those malpractices which have militated against the interests of the cotton grower and have marred the reputation of Indian cotton both in India and abroad. The framing of the necessary rules before the Act can be applied in particular areas is at present under the consideration of the Provincial Governments* concerned. The introduction of a similar legislation in the Punjab is also engaging the attention of the Punjab Government, the chief problem there being the mixing of cotton. Among the Indian States, Hyderabad has been a pioneer in the field of legislation of this type, the licensing of cotton ginning and pressing factories being in operation there from 1931.

MALPRACTICES.

17. Complaints regarding deliberate mixing of seed with lint in certain parts of Central India, at Kuksi in Dhar State, in Barwani and at Ujjain, Bankaner and Bag in Gwalior State were reported and the attention of the State authorities concerned was drawn to them. In most cases, the owners of the factories were warned to be careful in future. In the case of the complaint from Barwani, no action could be taken as the complainants could not supply the necessary particulars relating to the bales which would enable the owners of the factory to be traced.

Complaints regarding the admixture of seed in cotton at Bhavi in Jodhpur (Marwar State) and at Raman in Patiala State were reported by the Karachi Cotton Association. The authorities of these States who were addressed in the matter warned the owners of the factories concerned.

A cotton exporting firm in Bombay reported that cotton was being fraudulently packed at a mill in Khandwa, Central Provinces. The malpractice, though punishable under Section 3A (1) of the recently passed Cotton Ginning and Pressing Factories (Central Provinces Amendment) Act, could not be dealt with as the Act was not in force at the time. The complaint was, however, brought to the notice of the Provincial Government and the Director of Agriculture.

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* The Central Provinces Government have since enacted rules which were published finally in the Central Provinces and Berar Gazette of 29th October 1937 (*Appendix VI*). The Central Provinces and Berar Government have also issued a Press Note bringing this fact to the notice of all the cotton ginning and pressing factories owners in the province.

The Karachi Cotton Association brought to the notice of the Committee for necessary action a tender in which certain bales were declared false packed. The cotton in these bales consisted of different varieties of superior and inferior cotton which were mixed and packed in such a way as to materially reduce the value of the bale. As the bales came from a factory in the Bikaner State, the State authorities were addressed and they issued a warning to the press owner concerned.

A complaint regarding seedy cotton at Raman in Patiala State was received through a Bombay firm and the East India Cotton Association. A report was made to the authorities concerned who warned the owner of the factory to be careful in future.

A firm in Karachi complained of false-packed bales received by them from Maur in Patiala State. The matter was reported to the State authorities and the press owners were duly warned.

The attention of the Committee was drawn to a circular dated the 4th May 1935 issued by the Gwalior Durbar urging the owners of pressing factories to mark bales in such a way as to indicate clearly the kind of cotton contained in them and also whether the bale contained pure or mixed cotton, any contravention of the order being liable to a fine extending to Rs. 500. Although the Committee felt that such marking was likely to increase rather than decrease the evil of mixing, it suggested to the Durbar that the proposal should be given a trial.

As a result of complaints received from the International Federation of Master Cotton Spinners' and Manufacturers' Associations about the presence of foreign matter in Indian cotton, the matter was taken up with the Chairman of the Lancashire Indian Cotton Committee. His inquiries showed, however, that as far as Lancashire spinners were concerned there were no complaints regarding Indian cotton and that they were satisfied with it.

COTTON MARKETS.

18. During the year two new cotton markets were established under the Bombay Cotton Markets Act in the Bombay Presidency, one at Baramati in South Central Division and the other at Bavla, Dholka taluka, Ahmedabad district. This raised the number of regulated markets in the province to five, the others being at Dhulia, Amalner and Bailhongal. The question of establishing regulated markets at Broach, Jalgaon, Dondaicha, Gadag and Nargund and other centres in Gujerat is under consideration.

Except in the area of the Tiruppur Municipality in the Coimbatore district of the Madras Presidency, no regulated cotton market has been established anywhere in that Presidency under the Madras Commercial Crops Markets Act of 1933. The Provincial Government desire to have more experience of the working of the Act before extending the Tiruppur notified area or bringing other areas under the operation of the Act.

In the Central Provinces there were until recently only two regulated cotton markets, one at Warora and the other at Chanda. Five new markets under the Central Provinces Cotton Market Act have, however, been established since, viz., at Arvi, Pulgaon, Hinganghat and Wardha in the Wardha District and at Katol in the Nagpur District; proposals for the establishment of such markets at Harda and Timarni are under the consideration of the Provincial Government.

The Punjab Government, it is understood, are not likely to take up in the near future the question of the establishment of open regulated cotton markets.

In the Sangli State, a Huzur Order regulating the sale and purchase of commercial crops in the State is in force.

The framing of rules under the Baroda Agricultural Produce Markets Act is still under consideration.

In the Hyderabad State the markets at the following places are controlled under the Hyderabad Agricultural Markets Act :—

Aurangabad, Jalna, Parthur, Hingoli, Sailu, Nanded, Umri, Latur, Raichur and Warangal.

At these places, the application of the Act has been extended not only to cotton but also to other important agricultural produce.

UNIVERSAL STANDARDS FOR INDIAN COTTONS IN INDIA.

19. Prior to 1933, standards for Indian cotton were prepared by the East India Cotton Association and the Karachi Cotton Association. The latter Association prepared standards for *Bengals, Sind, Punjab-American* and *Sind-American* cottons, whilst the former had standards for other varieties as well. As the standards prepared by these two Associations in respect of the same varieties of cotton were different and resulted in a certain amount of competition between the two markets, the position was considered to be detrimental to the interests of the cotton trade and the Committee therefore took up the question of adopting standards which would be of universal application in India. Accordingly the East India Cotton Association and the Karachi Cotton Association were approached in the matter and with their co-operation, for the first time in 1934, standards common to the Bombay and Karachi markets were prepared by a Special Sub-Committee of the Committee known as the Standards Sub-Committee. This has now become one of the annual activities of the Committee. The Standards Sub-Committee passed, during the year, universal standards applicable in India for the following varieties of cotton :—

Kumptas, Oomras, Mathias, Broach and *Dholleras.* The universal standards for *Bengals, Sind, Punjab-American* and *Sind-American* were, however, not prepared during the year, as owing to unavoidable circumstances the Sub-Committee could not meet for this purpose.

In accordance with the decision arrived at in 1935, the reference standards of the Committee which were stored in hermetically sealed zinc cases at Bangalore were compared with the duplicate sets stored at the Cotton Exchange, Sewri, under identical conditions and it was found that the standards from Bangalore were up to about half a grade better than the corresponding boxes kept at Sewri.

The Karachi Cotton Association have accepted the Universal Standards of the Committee as the basis for their own standards, and, during the year under review, trading was done on that basis. The Standards Committee of the East India Cotton Association have recommended to the Board of Directors of the Association that the Universal Standards should be adopted as the basis for the preparation of the official standards of the Association subject to the reservation that the remaining standards should be prepared by the Standards Committee of the Association as heretofore.

REPRESENTATION ON THE INTERNATIONAL FEDERATION OF MASTER COTTON SPINNERS' AND MANUFACTURERS' ASSOCIATIONS.

20. Mention was made in previous years' reports that in order to deal more effectively with complaints, arising abroad regarding faults, often of a minor nature, in Indian cotton, which frequently received wide publicity through the publication of the proceedings of the bodies at which they were discussed, the Committee considered it desirable to obtain, if possible, representation on the International Federation of Master Cotton Spinners' and Manufacturers' Associations, Manchester. An application was made and the Committee was admitted as an Associate Member. It is hoped that this contact will ensure correct presentation of the position in India, either by the Committee or its duly appointed representative, whenever cases relating to Indian cotton come up for discussion at the meetings of the Federation.

UNITED PROVINCES COTTON PEST CONTROL ACT.

21. During the year, the United Provinces Cotton Pest Control Bill, to which reference was made in last year's report, was passed into law but it has not yet been put into force. The Rules to be framed under the Act have not yet finally received the approval of the Provincial Government.

MEANS TO PREVENT THE INTRODUCTION OF FOREIGN COTTON PESTS.

22. *The Mexican Boll-weevil* (*Anthonomus grandis*).—The restrictions placed by the Government of India in 1925 on the import of American cotton into India with a view to prevent the introduction of the Mexican Boll-weevil continued in force, without change, during the year under review. Under these regulations American cotton can be imported into India only through the port of Bombay and after fumigation with hydrocyanic acid gas on payment of the prescribed fees. Imports of American cotton declined to 16,923 bales during the year from 24,121 bales in the preceding year.

The Red (Sudan) Boll-worm (Diparopsis castanea) and other pests.— The entire prohibition of the import of foreign *kapas* (unginned cotton) under Government of India Notification No. 897-Agri., dated the 24th July 1925, and the restrictions placed on the import of foreign cotton seed under Notification No. 1213-Agri., dated the 27th May 1930, of the Government of India in the Department of Education, Health and Lands, continued to be in force. Under the 1930 Notification 14 parcels of cotton seed were received, examined and, where necessary, fumigated, during the year.

It may be mentioned that when the restrictions above referred to were introduced in British India in 1925, the co-operation of maritime Indian States and foreign administrations was also sought. The Foreign Administrations and some of the maritime States agreed without reservation and took steps to prohibit the import of foreign cotton seed and *kapas* into their territories but certain Kathiawar States while expressing their agreement with the Government of India in principle prohibited the importation of foreign cotton seed and *kapas* from non-Asiatic countries only on certain conditions. So long as the imports into Kathiawar States of Asiatic cotton seed or *kapas* were not excessive, the matter was not pursued further but recently, large quantities of cotton seed, apparently of Asiatic origin, were imported into one of the Kathiawar States and this has necessitated the revival of the question. The representatives of the Nawanagar, Junagadh, Kutch and Baroda States were invited to attend the meeting of the Committee in March 1937 to discuss the matter and as a result of the mutual exchange of views the Kutch Durbar have agreed to prohibit the import of foreign cotton seed and *kapas* into the State. It is hoped that other maritime States in Kathiawar will also fall in line at no distant date.

COLLECTION AND SUPPLY OF INFORMATION.

23. As usual, notes* on the progress in the Provinces and Indian States in the introduction of improved varieties of cotton and on the work of the Committee were supplied to the East India Cotton Association and the Karachi Cotton Association for publication. The weekly statements of purchases and arrivals of American cotton were published as usual for general information. The names of ginning and pressing factories in Indian States with the requisite details regarding press marks, name of owner or occupier, etc., were obtained and communicated to the Director-General of Commercial Intelligence and Statistics, Calcutta, for publication in the *Indian Trade Journal* and for incorporation in the all-India list of cotton ginning and pressing factories published by that Department.

PUBLICITY AND PROPAGANDA.

24. The services of the Committee's Publicity and Propaganda Officer were again utilised during the year for bringing to the notice of the public

* *Appendix VII.*

at large the activities of the Committee by means of Press *communiqués*, publications, pamphlets and posters and by participation in exhibitions and shows at which suitable exhibits were displayed and technological demonstrations given. The exhibitions in which the Committee participated during the year were :—The United Provinces Industrial and Agricultural Exhibition, Lucknow, and the exhibitions held at Delhi and Bombay under the auspices of the Association for the Development of Swadeshi Industries and Fairs, Ltd. In connection with the publicity and propaganda work of the Committee the Publicity Officer of the Committee visited Lucknow, Cawnpore, Allahabad, Delhi and Poona.

PUBLICATIONS.

25. A number of important scientific and technical journals are received by the Committee partly by subscription and partly on an exchange basis. These are circulated among its research workers and by this means opportunity is afforded them to keep in touch with the latest scientific literature which would otherwise not have been ordinarily accessible to them. The arrangement has the added advantage of being very economical.

The Committee desires to express its indebtedness to those institutions which have placed its name on their free mailing lists. Particular mention may be made of the British Cotton Industry Research Association for its Summary of Current Literature and the Shirley Institute Memoirs, and the Empire Cotton Growing Corporation, the British Cotton Growing Association and the East India Cotton Association for the supply of their publications for distribution to members. The Committee also records its thanks to the Indian Trade Commissioner, London, the U.S.A. Department of Agriculture, the Egyptian Ministry of Agriculture, Technical and Scientific Service, the Liverpool Cotton Association, the Lancashire Indian Cotton Committee, the Imperial Bureau of Plant Genetics, Cambridge, the Textile Institute, Manchester, the Imperial Institute, London, the Indian Statistical Institute, Calcutta, the National Institute of Sciences, Calcutta, the Academy of Sciences and other Associations and Chambers of Commerce for supplying it with reports, statistics and other valuable literature from time to time. The Committee is also on the free exchange list of the Imperial Council of Agricultural Research, the Imperial Institute of Agricultural Research, Delhi, and the Director-General of Commercial Intelligence and Statistics, Calcutta.

SECRETARY'S TOURS.

26. During the year under report, the following places were visited by the Secretary, in connection with the work of the Committee :—

Indore, Calcutta, Rangamati, Dacca and Delhi.

FINANCIAL.

27. In *Appendix VIII* will be found a statement showing the Receipts and Expenditure of the Committee and also the Balance Sheet for the year ended March 31st, 1937. Receipts amounted to Rs. 9,23,137-8-7 and expenditure to Rs. 10,51,116-11-7.

With the separation of Burma from India under the new constitution, the cess hitherto collected from that province is no more available to the Committee; this loss, however, will to some extent be compensated for by the fact that the Committee will no longer be called upon to sponsor cotton schemes in that province.

CHAPTER III.

STATISTICS.

28. In view of the important rôle that cotton plays in the national economy of India, considerable time and attention of the Committee are devoted to the improvement, preparation and publication of cotton statistics. The work done under this head during the year under report is briefly reviewed in the following paragraphs :—

29. *Cotton Crop Estimates.*—In order to ensure their simultaneous publication at Bombay and Calcutta, the estimates of the cotton crop were received by wire from the Director-General of Commercial Intelligence and Statistics, Calcutta.

During the year, the area under cotton in India (including Burma) decreased to 25,219,000 acres from 25,999,000 acres in the preceding year. This was mainly due to the reduction in the area sown with cotton in Hyderabad State and in parts of the Bombay Presidency, owing to unfavourable seasonal conditions at sowing time. The total estimated outturn, including Burma, for 1936-37 was 6,307,000 bales of 400 lbs. each as against 5,933,000 bales for 1935-36, the yield establishing an all-time record breaking the previous 1925-26 record of 6,215,000 bales from an area of 28,403,000 acres. The average yield per acre which was the highest ever recorded amounted to 100 lbs. against 91 lbs. in the preceding year.

The higher yields per acre obtained in the past two years may be attributed partly to favourable seasonal conditions and partly to the use of better yielding varieties and more fertile land. A notable feature was the increase in area under the Punjab and Sind-American cottons from 1,052,000 acres in 1934-35 to 2,175,000 acres in 1936-37. This increase was, however, mainly confined to the irrigated tracts.

30. *Improvement of Cotton Forecasts.*—With the sanctioning in 1934 of a scheme for the improvement of the cotton forecasts of the Bombay Presidency and Sind (including Indian States) at a total cost of Rs. 28,194, practical shape was given to the Committee's efforts to improve the accuracy of the cotton forecasts of India. The discrepancies in the area, anna valuation, and standard yield figures brought to light in the course of the inquiry are being examined and remedial measures adopted to rectify these as far as possible. The investigation has also shown that the standard yield figures, which have not undergone any material alteration for the last thirty years, require revision which has now been taken up both for British districts and Indian States in the Bombay Presidency.

One of the factors, which renders difficult the appraisement of the accuracy of Government cotton forecasts in India, is the lack of exact information regarding the quantity of *kapas* (seed cotton) and loose (ginned but unpressed) cotton consumed, chiefly in villages for such domestic purposes as hand-spinning and the making of quilts, mattresses, cordage, etc. Such extra-factory consumption has been conventionally estimated at 750,000 bales for the whole of India but the accuracy of this figure has been discredited frequently. To arrive at a more reliable estimate of the extra factory consumption, local enquiries were conducted in typical localities in different Provinces and States with the aid of funds provided by the Indian Central Cotton Committee and the material collected is now being examined.

The improvement of the cotton forecasts has been receiving the close attention of the Committee and every year a *post mortem* examination of the forecasts is conducted at the close of the year by a special Sub-Committee of the Committee. This examination has brought to light several sources of error and has enabled remedial measures to be formulated. During the year under report the attention of the Punjab Government was drawn to the recurring under-estimation of the Punjab cotton forecast and as a result, the question of revising the standard yield figures for the Punjab crop is being investigated by the Provincial Government. A source of under-estimation in the Bengal cotton forecasts was discovered and set right.

During the year the Committee decided to publish annually a report on the accuracy of the all-India cotton forecasts of each season for general information. This decision was given effect to in Statistical Leaflet No. 5, entitled " Report on the accuracy of the Cotton Forecasts of 1934-35 and 1935-36 seasons."

31. *Staple Length of the Indian Cotton Crop.*—As usual, a report on the estimated production, during the season, of Indian cotton of different staple lengths was issued in May. The presentation in the report of trade estimates, side by side with the Government estimates, was continued during the year. The Committee warmly acknowledges the assistance which it has received from the trade in this connection.

32. *Press Statistics.*—Since 1925, weekly returns of cotton pressed in British India have been collected by Provincial authorities under the Indian Cotton Ginning and Pressing Factories Act, 1925, and forwarded to the Director-General of Commercial Intelligence and Statistics for publication. To make the statistics more complete for the whole of India, the co-operation of Indian States in compiling and supplying similar figures for the States was enlisted and it is gratifying to record that all the sixty-nine States addressed have responded either by introducing legislation or passing the necessary executive orders. Press returns are being supplied by such States as have presses, including Gwalior State from which the returns are now being received regularly.

Reference was made in the previous year's report to the proposal to obtain figures of cotton pressed in Indian States in statistical bales of 400 lbs. net, in addition to the running bale figures now being supplied. All the States addressed have expressed their willingness to furnish the necessary information with effect from the next cotton season.

During the season 1936-37, 4,457,031 bales were pressed in British India, including Burma, and 1,923,440 bales in Indian States, making a total of 6,380,471 bales for the whole of India, the corresponding figures for the preceding season being 4,321,262, 1,631,902 and 5,953,164, respectively.

33. *Loose (unpressed) Cotton Statistics.*—The statistics of cotton pressed referred to in the preceding paragraph do not account for the whole of the Indian cotton crop, as, in addition to the cotton utilised for village or extra factory consumption, chiefly in the form of *kapas*, for which, as explained elsewhere, efforts are being made to obtain more reliable estimates, mills situated in the heart of cotton growing areas often use considerable quantities of loose (ginned but unpressed) cotton. Up to 1935-36, the statistics of loose cotton received at mills in the major cotton growing provinces were obtained on a voluntary basis and published but with the year 1936-37 these statistics are being collected under statute by an amendment of the form of return submitted by mills under the Indian Cotton Cess Act, 1923. Similar information is being supplied by Indian States voluntarily through the courtesy of the Durbars concerned. During the year 465,215 bales of loose cotton were consumed by mills in India. The relevant figures for 1926-27 to 1936-37 are shown in *Appendix IX* to this report.

34. *Consumption* :—As in the past, figures for consumption of Indian cotton in mills in British India and Indian States were published monthly. The season's total consumption of Indian cotton in mills in India amounted to 2,631,296 bales of 400 lbs. net, as against 2,677,688 bales in 1935-36 (vide *Appendix IX*). Compared with last year, consumption in the Madras Presidency increased by no less than 45,000 bales. Other Provinces and States either registered a decline or showed only small increases. The spurt in consumption in the Madras Presidency was mainly due to the rising importance of Coimbatore as a mill centre, where the number of active spinning mills rose from 18 in 1935-36 to 26 in 1936-37.

According to the figures published by the International Federation of Master Cotton Spinners' and Manufacturers' Associations, the world's total mill consumption of Indian cotton, exclusive of Italy (for which figures are not available) showed an increase from 5,445,000 bales duing the year ending 31st July 1936 to 5,948,000 bales during the corresponding period of 1936-37.

35. *Exports.*—The exports of Indian cotton during the season, constituted a record, totalling 4,267,000 bales of 400 lbs. net, against 3,709,000 bales in the previous year. These figures exclude exports from Burma.

36. *Stocks.*—By the co-operation of Trade Associations and Market Committees, the response to the Committee's efforts in the matter of collection of figures of stocks of cotton held by the trade at the end of the season has been very encouraging. The information collected in respect of the stocks held on the 31st August 1937 is contained in *Appendix X.*

Though the season adopted for the cotton crop of the Madras Presidency is the year ending 31st January, the error in taking the 31st August as the last day of the cotton season for purposes of uniformity is not likely to be considerable in the case of the Madras cottons other than Tinnevellies, Salems and Cambodias. Accordingly, the statistics of stocks of Tinnevellies, Salems and Cambodias held by the trade in the respective tracts and by the mills in the whole of the Presidency on the 31st January each year have been separately collected by the Director of Agriculture, Madras. As, however, this arrangement leaves a gap in the statistics of stocks of Northerns, Westerns and Coconadas, for which also the season is taken to be the year ending 31st January in the Madras cotton forecasts, arrangements have been made for the collection of figures for mill and trade stocks of all cotton held in the Madras Presidency on the 31st August as well as the 31st January of each year. The relevant figures for the 31st January 1935, 1936 and 1937 are given in *Appendix X.*

37. *Demand for various types of Indian cotton.*—Statistics of the export and Indian mill demand for the various types of Indian cotton are of considerable importance to those responsible for shaping and directing the cotton policy of India and the Committee has, therefore, been collecting the relevant data in this connection through direct inquiries on a voluntary basis. The tables in Statistical Leaflets Nos. 3 and 4 (1936-37), giving the results of the inquiry carried out in respect of receipts at mills and exports during 1936-37, are reproduced in *Appendices XI* and *XII.*

38. *Publication of "A Guide to Indian Cottons."*—The need for an authoritative publication dealing with the characteristics of Indian cotton had long been felt. This want was met in the year under review by the issue of the publication entitled "A Guide to Indian Cottons" as a result of the joint efforts of the East India Cotton Association and the Committee. The popularity of the Guide can be surmised from the fact that within a short time over a thousand copies were sold. Translations of the Guide in Gujerati, Marathi, Kanarese, Hindi and Urdu, for which it is believed there is a demand, will be published shortly.

39. *Publications.*—The undermentioned statistical publications were issued during the year under report.

1. *Statistical Leaflet No.* 1, Fourth Issue (1936-37), "Report on the staple length of the Indian cotton crop of 1936-37 season."
2. *Statistical Leaflet No.* 2, Third Issue (1935-36), "Stocks of Indian raw cotton held in India by the mills and the trade on 31st August 1936."

3. *Statistical Leaflet No.* 3, Third Issue (1935-36), " Receipts at mills in India of raw cotton classified by varieties—1935-36 season."

4. *Statistical Leaflet No.* 4, Third Issue (1935-36), " Exports by sea of Indian raw cotton classified by varieties—1935-36 season."

5. *Statistical Leaflet No.* 5, First Issue (1934-36), " Report on the Accuracy of the All-India Cotton Forecasts of 1934-35 and 1935-36 seasons."

6. *Statistical Bulletin No.* 5 (1934-35), " Supply and distribution of the various types of Indian cotton during the season of 1934-35."

7. *Statistical Bulletin No.* 6 (1935-36), " Supply and distribution of the various types of Indian cotton during the season of 1935-36."

8. *A Guide to Indian Cottons*—a joint publication of the East India Cotton Association and the Indian Central Cotton Committee.

CHAPTER IV.

RESEARCH.

40. The research policy of the Committee is carried out in two ways, viz., by direct control of the Technological Laboratory at Matunga, Bombay, and by granting subsidies to Departments of Agriculture in Provinces and States for the investigation of cotton problems mainly of an all-India importance or for large areas where cotton is an important crop. The Committee, in addition, contributes a large sum of money every year to the Institute of Plant Industry, Indore, where problems of fundamental economic and agricultural importance are under investigation. The problems of research in Provinces and States include several schemes—botanical for breeding high yielding superior types of cotton, entomological for the study of the life-history of certain cotton pests and measures to combat them, mycological for ascertaining ways and means to prevent loss due to wilt and root rot and physiological for the investigation of crop growth and bud and boll shedding. The Committee also gives grants to Agricultural Departments and Co-operative Sale Societies for the extension and marketing of improved varieties of cotton and the maintenance of nuclei of pure seed of approved varieties of cotton. It has, in addition, undertaken jointly with the Imperial Council of Agricultural Research, an investigation into the cost of cultivation of cotton, sugarcane and their rotation crops in the principal cotton and sugarcane growing areas of India. During the year under report, the Committee sanctioned funds for 37 research schemes, 12 seed extension and marketing schemes and two schemes for the maintenance of nuclei of pure seed of approved varieties of cotton at a total estimated cost of Rs. 6,20,764. In addition a sum of Rs. 3,13,530 was sanctioned for the Technological Laboratory, Matunga, the Institute of Plant Industry, Indore, and the economic inquiry into the cost of cultivation of cotton, sugarcane and their rotation crops. The Committee also offers scholarships and training grants for post-graduate training in India and abroad in subjects pertaining to the various aspects of cotton. All schemes before they finally receive the sanction of the Committee are first thoroughly examined by Special Sub-Committees consisting of the expert members of the Committee and others specially co-opted because of their scientific qualifications.

A close touch is maintained with the work being done under the various schemes by means of progress reports and programmes of work which those in charge of schemes are required to furnish annually.

TECHNOLOGICAL LABORATORY.

41. In the past the Annual Report of the Director, Technological Laboratory, formed part of this report, but from this year it will be issued

as a separate publication of the Committee, covering the period 1st June to 31st May. The Annual Report for the year ending 31st May 1937 has already been published.

During the year covered by this report, the resources of the Technological Laboratory continued to be availed of, as in the past, by the agricultural officers for assessing the spinning value of their new strains ; mills also utilised to a much greater extent than hitherto the facilities afforded by the Laboratory for the testing of their samples or for the solution of their problems. During the year 431 samples divided into 468 lots were spun into 1,547 counts. Samples are tested at the Laboratory under the following groups :— (a) agricultural samples, (b) samples of standard Indian cottons, (c) trade samples and (d) technological samples. (a) Agricultural samples represent either new or improved varieties under trial by Agricultural Departments and also some old types grown in connection with certain field experiments. The number of samples tested under this head during the period under review was 213 as against 290 for the corresponding period in the preceding year. (b) The standard cottons mostly represent the improved varieties grown on a commercial scale ; during the period under review, tests were completed on the following eight varieties of the 1936-37 season :—*Punjab-American* 289*F*, *Verum* 262 (Nagpur), *Verum* 262 (Akola), *V.* 434 (Akola), *Late Verum* (Nagpur), *Umri Bani*, *Sind Sudhar* and 1027 *A.L.F.* The results of the tests on these cottons were published in four-page circulars, as usual. (c) The trade samples tested fall under two heads :—(i) those supplied by the East India Cotton Association and which represent the fair average quality of different varieties of Indian cotton which form the bulk of the cotton crop ; and (ii) those supplied under arrangement with the Bombay and Ahmedabad Millowners' Associations and which represent the early arrivals of the various Indian cottons into the local markets. Altogether 30 samples of the first category and 23 of the second were tested during the year and the results published in 2 or 3-page circulars which were widely distributed to the trade and industry both in this country and abroad. In addition to these tests, samples received from individual mills and firms in their private capacity were also tested, as in the past, on payment of the fees prescribed by the Indian Central Cotton Committee. During the period under review, 6 such samples were received for spinning tests, 24 for fibre tests, 23 for yarn tests, 41 for moisture tests, one for Shirley Analyser test and one for blow room test. Among the samples tested for the trade, the following three were considered to deserve special mention :—(1) 4 samples of Broach (Palej) and Broach (Amod) cottons sent by the East India Cotton Association to help the Appeal Committee of the Association to check up their decision on these cottons ; (2) 21 bundles of yarns of different counts sent by the Bombay Millowners' Association for the determination of their actual counts (a) at the prevailing humidity, and (b) after they were completely dried in a conditioning oven, with the object of finding out the extent of malpractice in the matter of differences between the actual and nominal counts and of ascertaining whether or not these differences lay within permissible limits ; (3) a sample of cotton grown in Afghanistan sent by a firm and tested for the first time at the Laboratory

(d) Technological samples comprise those samples of cotton which are tested at the Laboratory in connection with certain research problems. Investigations of interest to the trade completed during the year under this head were: (1) spinning tests on mixtures of staple fibres and Indian cottons, (2) tests on Indian cottons with different systems of high draft spinning, (3) effect of storage on seed cotton prior to ginning, (4) limit spinning tests, (5) combing of Indian cottons, (6) effect of storage of lint on its quality, (7) quality of lint in relation to ginning factors, (8) deterioration of Broach (Palej) cotton with lapse of time and (9) effect of pre-humidification on the spinning performance of a cotton.

Side by side with the work of the Spinning Laboratory numerous research problems are being investigated in the Fibre Testing, Physics, Chemistry and Moisture Testing Sections of the Laboratory.

A new scale of fees for tests carried out at the Technological Laboratory was fixed during the year.

INSTITUTE OF PLANT INDUSTRY, INDORE.

42. The Annual Progress Report of the Director, Institute of Plant Industry, Indore, for the year ended 30th June 1937 is reproduced in *Appendix XIII* of this report. The primary object of the Committee in financing the Institute, which was established in 1924, was to provide a central research station for cotton in the black soil area of the Malwa Plateau. The programme of work includes the general botany, physiology and genetics of Indian cottons ; in addition, a number of agricultural investigations connected with the cultivation of cotton and other crops are also carried out. The Institute is maintained by annual contributions from the Committee on the one hand and the Member States in Central India and Rajputana on the other and representation on the Governing Body of the Institute in any one financial year is proportionate to the grants made by them during the previous financial year. During the year 1936-37, the contributions of the Committee to the Institute amounted to Rs. 1,11,000 against Rs. 51,000 of the Member States, and accordingly the Committee was represented on the Governing Body by nine members against five representing the States.

GRANTS-IN-AID.

SCHEMES IN PROGRESS IN PROVINCES AND STATES.

MADRAS.

43. *Herbaceum Scheme.*—This is one of the earliest schemes sanctioned by the Committee in 1923 and its original object was to secure a suitable *Uppam* (*G. herbaceum*) strain which would spin above 20s to replace *Karunganni* (*G. indicum*) in the " Salems " and " Tinnevellies " tracts where, due to low and precarious rainfall, *Uppam*, a more hardy variety than *Karunganni*, gives better yield than the latter in adverse seasons, though the reverse is the case in years of good rainfall. The difficulty of obtaining suita-

ble *Uppam* strains by unit selection method was realised in 1930 and it was then decided to resort to hybridisation. One of the hybrid strains, viz., 4714, which was found promising in previous years, was given district trials and the results show that though it is quite suitable for the regions north of Virudunagar, it may not prove very satisfactory for the area south of it. This strain has, however, given an indication that it suffers in yield by the presence of some sterile plants and steps have been taken to remedy this defect by selections. In the previous year promising material had been secured combining yield, ginning percentage and staple length. Eight out of the selections, including 4714, and one of its broad-lobed mutants gave more than 30 per cent. increase over the control *K.P.T.* 1. A large number of single plant cultures, possessing lint length above 24 mm. and ginning outturn above 31 per cent. were tested for yield in replicated plots. Thirty-one of these were found significantly better than the control. 191 single plants with desired combinations of lint length and ginning percentage have been selected from direct and back-crossed population and will be tested for yield in the next season.

44. *Pempheres and Physiological Scheme.*—This scheme was sanctioned in 1925 for a period of 5 years but, owing to difficulty in securing a competent Plant Physiologist it had to be kept in abeyance till a suitable officer became available. In 1930 it was decided to send for training to England two officers selected from the Madras Agricultural Department with a view to their eventually occupying the posts of Physiological Botanist and Bio-chemist. Although expenditure in connection with the training of these two officers and on preliminary investigations was incurred previous to 1935, the scheme did not seriously commence to operate until February of that year. It consists of two parts, viz., (1) investigations for devising measures to control the damage done by the Cotton stem-weevil (*Pempheres affinis*) which causes fairly high mortality among cotton plants, especially of the exotic types, (2) evolution of a strain of *Karunganni* cotton that would be least affected by the February rains in the 'Tinnies' area. The first problem is being investigated at Coimbatore and the second at Koilpatti.

The control of *Pempheres* is being pursued in three directions, botanical, bio-chemical and entomological. On the botanical side the aim is to evolve a strain which will not allow the insect time enough to complete its life cycle inside the stem ; on the bio-chemical side, the causes that make strains susceptible to the insect and the factors that help the plants to resist its attack more efficiently are being investigated ; on the entomological side, efforts are concentrated to survey the distribution of the insect and to explore the possibility of checking its spread by biological methods.

During the survey of the pest, four species of parasites were found but as these parasitised the stem borer only at the grub stage and no other parasites were found attacking it at the other stages, this line of control was not considered promising, particularly as the percentage of parasitisation even at the grub stage was low.

On the bio-chemical side the investigations showed that gum formation in the attacked plants was due to the bacterial activity associated with the carbohydrate make-up of the plant. This phenomenon of gum formation has brought out clearly the importance of affording protection against *Pempheres* attack.

The botanical work was confined to the testing of a number of varieties of cottons resistant to the *Pempheres* attack. Out of several varieties tested, only four, viz., *Quebradinho, Verdao, Moco* and *Bourbon* suffered low mortality from the pest. Local varieties except *Nadam* suffered more. These varieties, however, are late maturing and poor in yield compared with *Co.* 2, but they may prove useful for breeding purposes. The year's tests showed that indigenous cottons manifested distinctly higher percentage of adult emergence and mortality while the three Brazilian types recorded very low percentages.

The data of the last season on the evolution of a strain in *Karunganni* cotton indicated that shedding response to rains depended on the stage of plant growth at the time of rainfall and that there seemed to exist a critical period for each selection. Four separate waterings at fortnightly intervals were accordingly tried to study the relative responses of the strains at every watering. The best four performers of the last year's trials and sixteen fresh selections chosen from the progeny row tests on the basis of yield were grown in randomised plots replicated four times. In each type and treatment, one row of plants was fitted with a trough of hessian cloth to collect shed forms. The results showed that 8 cultures and the control were not harmed by any of the 4 waterings, and of these, three cultures showed distinct improvement in yield after the supply of water. On scrutiny of the shedding records, it was noticed that the average shedding curve was little affected by the waterings. Another set of 15 cultures were examined and the analysis of their yields did not show any superiority over the control.

With a view to finding if mixing other crops with cotton would improve retention of bolls, 20 plants in each of the treatments of the mixed cropping experiment conducted under the Madras Fodder Cholam Scheme were studied in detail with regard to number of buds, flowers and bolls produced and it was observed that cotton sown thick was the best treatment for boll retention.

45. *Fodder Cholam Scheme.*—This scheme was started in 1931 to ascertain the causes of harmful effects of *Cholam* (*Andropogon sorghum*) as compared with those of *Cumbu* (*Pennisetum typhoideum*) on the succeeding crop of cotton in the black cotton soils of Tinnevelly district and also to find out suitable remedial measures by which the cultivators of this district might have their *Cholam* fodder without suffering any loss in the yield of succeeding cotton. The investigations have shown that the low yield of cotton after *Cholam* grown for fodder is due to an increase in the exchangeable sodium and a corresponding fall in magnesium in *Cholam* plots as compared

with *Cumbu* plots. It has been mentioned in previous reports that the harmful effects of the *Cholam* crop on the succeeding crop of cotton are not noticed if the former is cut at the shot blade stage or if the formation of grain by topping the plants at the flowering stage is prevented. These measures, however, only result in lower yields, which the cultivators cannot afford, even when thick sowing is resorted to. During the year the experiment of associating a pulse with *Cholam* was tried to see if the ill-effects of the latter could be balanced by the beneficial results of the former. Mixture of black gram and green gram with *Cholam* were tried but such plots showed no distinct improvement on the cotton crop over those of pure *Cholam* plots. A peculiarity of *Cholam* soils is that they crack very sparingly and hold water tenaciously and experiments were tried to correct this defect by allowing the land to remain uncultivated during summer, increasing the density of plant population by sowing cotton thick or interplanting other crops between the cotton lines by working a coulter deep at different periods in the interspace between the rows to prune the roots and by the use of correctives. The studies indicate that thick sowing of cotton, allowing the *Cholam* soil to crack in the summer and to plough it late and the application of correctives like gypsum and molasses will remove the harmful after-effects associated with *Cholam* cropping. These, however, need corroboration during normal seasons. The scheme has completed its term as sanctioned by the Committee and further investigations will be carried out under departmental control.

46. *Nadam Cotton Breeding Scheme.*—This scheme commenced in February 1933, with the object of securing one or two more suitable annual types of cotton which could replace *Nadam* (*G. obtusifolium*), a perennial variety in the red soil areas of Salem and Coimbatore districts where, due to the poverty of soil and precarious rainfall, neither *Karunganni* (*G. indicum*) nor *Uppam* (*G. herbaceum*) can be grown satisfactorily. *Nadam* being a perennial variety, serves as a breeding ground for pests like stem-weevil and pink boll-worm during the close period of *Cambodia* prescribed by the Madras Pest Act.

Sowing trials made during the first two years have given indications that annual types might be grown successfully on these soils from September to May. This would provide an effective close period between two cotton crops. It was also found that out of the several cottons tried the progenies of crosses between *Co.* 2 and South African cottons and between *Nadam* and *Karunganni* would provide suitable material for the isolation of useful strains. Yield trials carried out during the year were, however, adversely affected by unfavourable weather conditions, though the crosses gave far better outturns than *Nadam* in areas where comparison was possible.

BOMBAY.

47. *Broach Cotton Breeding Scheme.*—This scheme, which has now completed its fifth year, has for its object the breeding of suitable types of

cotton for the Nerbudda-Mahi zone with wilt-resistant, heavy yielding, high ginning and good spinning qualities to replace the local mixture consisting of a large percentage of *Goghari*, a rough and short-staple variety, susceptible to wilt but with a high ginning outturn. With this specific aim in view, a highly wilt-resistant and high spinning strain, *B.D.* 8, was crossed with mostly high ginning but poor staple quality *Goghari* types. In view, however, of the Committee's policy to replace, wherever possible, short staple cotton with medium or long staple cotton efforts are now concentrated on wilt resistance, heavy yield and fibre length. Originally, a highly wilt-resistant and good spinning strain of *B.D.* 8 was crossed with high ginning but poor staple quality *Goghari* types but subsequently, as a result of the change in policy, some of the crosses were rejected and fresh crosses of *B.D.* 8 with other types superior to *Goghari* in staple quality were made, while most of the remaining crosses were back-crossed with *B.D.* 8, with a view to increase the scope of selection for fibre properties. During the year under review, there were under trial 15 crosses in all (5 straight, 8 back and 2 composite) in different generations. Two of these, viz., *B.D.* 8 × *G.A.* 26-*F*6, and the back-cross, *B. D.* 8× (*B.D.* 8×*G.A.* 26-*F*1)-*F*4 yielded several segregates of fair promise. Fourteen progenies of segregate 76 of *B.D.* 8×*G.A.* 26, tested during the year, have given fairly stable performance, though there is some variation amongst them. All are superior to *B.D.* 8 in ginning, while 6 are equal to, and 1 slightly better than *B.D.* 8 in fibre length.

In the back-cross *B. D.* 8×(*B. D.* 8×*G. A.* 26-*F*1)-*F*4, three segregates were tried during the season with 10, 8 and 8 progenies and in all 8 best progenies from the 3 segregates have been selected for purity tests.

Selection in the local has yielded only two selections of some importance. New selection 12, a wilt-resistant, high ginning and medium spinning strain, is maintained as a fixed type ; while *N.S.* 49, though equally good, with better spinning quality but rather low ginning outturn, has been found to lodge badly during rain-storms and to be susceptible to jassid attacks.

48. *Jalgaon Cotton Breeding Scheme.*—This scheme, like the Broach Scheme, commenced in April 1932, with a view to secure, by unit selection or hybridisation, suitable wilt-resistant types with heavy yielding, high ginning and good spinning qualities and to replace local *N.R.* and *Banilla* in Khandesh. *Banilla*, though superior to local *N.R.* in ginning outturn, spinning qualities and yield, is susceptible to wilt and has deteriorated in spinning quality, since it was first introduced. The three selections *N.V.* 57-7, *N.V.* 56-3 and *N.V.* 56-17, which were reported as promising in previous years, have again maintained their superiority over *Banilla*, *N.R.* 6 and local *N.R.* *N.V.* 56-3 or *Jarila* for which a seed distribution scheme has been sanctioned by the Committee has proved its superiority in yield over selections *N.V.* 56-17 and *N.V.* 57-7 and even over local cotton in some localities. This strain is being tested at Poona with a view to isolating a few completely wilt-free types. This strain spins up to 40's against 41's

of *N.V.* 57-7 and 35's of *N. V.* 56-17. The highest spinning capacity of *Banilla* varies from 10's to 15's, while *N. R.* spins only up to 7's.

Many other new promising selections are under severe tests at Poona for wilt resistance.

49. *Scheme for improvement of Wagad cottons at Viramgam.*—While examining the possibility of growing medium and long staple cotton in the present short staple areas of India, the Committee in August 1935 decided that, in view of the absence of any serious attempt to improve the cotton of the large Dholleras tract, a comparative study of Indian and Iranian *herbaceum* cottons should be undertaken, with the object of finding out one or more suitable types for this tract. A special officer from the Institute of Plant Industry, Indore, was deputed to Iran to collect *herbaceum* types of cotton grown there and in August 1936, a five-year scheme was sanctioned for the improvement of *Wagad* and *Mathio* cottons, the work on *Wagad* cottons being centred at Viramgam and that on *Mathio* at Amreli. Simultaneously a small immune area was to be maintained at Jagudan under irrigation to safeguard the work at Viramgam. The scheme commenced on the 1st May 1937. Work on the scheme is directed to the improvement of *Wagad* cotton for yield, quality and earliness and these are sought to be achieved by selection from local *Wagad* and by hybridisation with Iranian *herbaceums* which are described to be extremely early and of good fibre qualities. Several selections together with derivative types of *Wagad* 8 × 1027 *A.L.F.* cross are under test at Viramgam. Additional selections from the material collected in the previous year by the Institute of Plant Industry, Indore, and also selections from Persian cottons brought from Persia are undergoing trials.

50. *Scheme for breeding of wilt-resistant cottons in Surat area.*—This scheme was sanctioned by the Committee in August 1936 and commenced work in April 1937. A two-acre plot has been set aside and the selections to be placed under trial have been carried out.

51. *Scheme for survey of Goghari Cotton in Gujerat.*—This scheme is the outcome of the Committee's policy to establish 1027 *A.L.F.* cotton in the tract lying south of the Nerbudda. A Seed Distribution Scheme was started in 1934 for rapid expansion of 1027 *A.L.F.*, but to facilitate this object it was considered necessary to launch a campaign against *Goghari*, an inferior short staple variety which was favoured by ginners of the tract on account of its high ginning percentage. A separate scheme was accordingly sanctioned in August 1934, with a view to tracing out where *Goghari* cotton was being grown and the ginning factories to which it was being delivered. As a result of propaganda previously undertaken by the Agricultural Department a reduction in the acreage under *Goghari* had already been effected but with the passing of the Bombay Cotton Control Act, 1935, which prohibits the cultivation, mixing or possession of *Goghari* cotton in Gujerat complete elimination of this cotton in the area south of the Nerbudda is not far

distant. During the year, 93 villages were surveyed in the Jalalpore, Bardoli and Ankleshwar talukas and the localities in which *Goghari* was found were duly reported. Some slight mixture of *Goghari* varying from 1 to 4 per cent. was found in a few scattered fields and the owners of these fields were duly warned. The inspection of seed cotton brought for delivery at ginning factories had also a salutary effect both on growers and ginners.

52. *Plant Puller Propaganda Scheme in Surat and Broach Districts.*— This scheme is the natural corollary of the Surat Boll-worm Clean-up Scheme sanctioned in 1930 for the purpose of bringing home to the cultivator in Gujerat the advantages of uprooting cotton stalks and stubbles before the end of May and thus depriving the pink and spotted boll-worms of their food material till the next crop of cotton. The Clean-up Scheme clearly demonstrated that by the removal of cotton stalks and stubbles in time a 25 to 30 per cent. increased yield could be obtained and on the termination of that scheme in 1934, the Committee sanctioned the Plant Puller Propaganda Scheme in order to popularise the cotton plant puller, a cheap and effective implement for uprooting cotton plants.

Intensive propaganda was continued during the year under report and as a result 95 per cent. of cotton stalks were uprooted in the Broach, Amod and Wagra Talukas of the Broach district; in Jambusar taluka, however, only 10 per cent. of the area was uprooted as the propaganda in this tract was taken up only recently. The number of plant pullers supplied in the Broach district amounted to 2,871. In the area south of the Nerbudda, in all, 4,528 plant pullers were supplied and in the three talukas of Ankleshwar, Olpad and Chorashi the work of uprooting cotton stalks has made good progress, the cleared up area being 35, 67 and 56 per cent. respectively, against 8 to 26 per cent. in the remaining talukas. A further stock of 2,600 plant pullers were sold during the year in the Surat district and it is estimated that the cleaned-up area in the above-mentioned three talukas will be 47, 77 and 62 per cent, respectively. The remaining talukas of the district were, however, not neglected and a fairly large number of plant pullers were utilised for cleaning the cotton area in that tract.

53. *Scheme for Defibration of cotton seed.*—This scheme was sanctioned in August 1934, and the installation of the defibrating machine was completed in January 1936, preliminary tests being commenced in the latter half of February 1936. The operations for the season started in March 1937 and ended in May 1937. The maximum outturn of the machine during the year reached 450 lbs. to 500 lbs. per hour against 120 lbs. in the previous year, and the cost of defibration was estimated at Rs. 2 to Rs. 2-8 per ton exclusive of power and Rs. 4 to Rs. 5 per ton inclusive of power, depending on the outturn and the degree of defibration. The results obtained as regards germination and oil tests do not indicate any distinct advantage of defibrating cotton seed, nor are data available to prove that the oil and cake produced from defibrated seed are superior to those obtained from raw seed. As the investigation showed no signs of being useful or of producing results of economic value, the scheme has been discontinued.

SIND.

54. *The Sind Physiological Scheme* was started in July 1927 with the object of ascertaining the optimum sowing time and irrigation and manurial requirements of cotton so that the Department of Agriculture might be in a position to advise the cultivator authoritatively on these points by the time the Sukkur Barrage was opened. In 1932 it was definitely concluded that March 15th to May 15th was the optimum sowing period for cotton under irrigated conditions in Sind and the investigation of the remaining two points, viz., the irrigation and manurial requirements of cotton, was continued. The irrigation experiments have shown that water requirements of cotton are the highest during the flowering and fruiting periods and that an initial watering of 8″ during the first 28 days followed in succession by two irrigations of 3″ each at interval of 20 days, 3 irrigations of 3″ each at 15 days' interval and five irrigations of 3″ each at 10 days' interval gives decidedly higher yield than the local method of 4″ every 20 days after the initial irrigation of 8″ or any other method of irrigation practicable under the barrage conditions. This work has now reached a stage when definite recommendations can be made to the cultivators.

The manurial experiments have proved that the application of manure to cotton is profitable in Sind and that satisfactory returns can be expected from the application of compost alone at the rate of 15 cartloads per acre before sowing or compost at the rate of 7½ cartloads per acre before sowing, followed by ammonium sulphate at the rate of 50 to 100 lbs. per acre 1½ months to 3½ months after sowing. Best yields are obtained when the quantity of ammonium sulphate is increased to 200 lbs. in addition to the basal application of compost. The results obtained have been found to be statistically significant and no further work appears to be needed on these experiments. The scheme closed down during the year under report.

PUNJAB.

55. *The Botanical Scheme* was started in 1925 with the object of investigating the causes of the periodic failures of American cotton in the Canal Colonies and obtaining suitable types of American and *Desi* cotton to replace the 4*F* and *Desi* cottons, respectively. In view, however, of the immediate economic value of the improved types of cotton work is being concentrated on the problem of breeding and a separate physiological scheme has been sanctioned for the investigation of the problem of periodic failures of American cotton. In previous reports it was stated that after extensive trials under different conditions of soil and climate, 43*F*, the best of the new American types, was finally selected for general distribution in place of 4*F*. During the year under review 43*F* continued to maintain its popularity with the cultivator and the trade alike and occupied an area of 25,000 acres against 2,000 acres in 1934-35. It is expected to cover 70,000 acres in 1937-38 season.

47F, a promising new strain of American cotton, appears to be even superior to *43F* in spinning qualities, while in other respects the two are very much alike. The area under this cotton is steadily increasing and is expected to occupy 10,000 acres in 1937-38, even without the assistance of the Agricultural Department. It has not yet been officially issued for general cultivation.

Of the *Desi* varieties, 39 *Mollisoni*, the distribution of which was started in 1934-35, has made very rapid progress during the past two years and is expected to cover a large part of the area in the Canal Colonies.

Jubilee cotton, a new *Desi* cotton, seems to be even more promising than 39 *Mollisoni*. Although still in the experimental stage, it is making rapid headway without the help of the Agricultural Department; its chief merit lies in the quality of its lint which is very similar to that of *4F* cotton.

A large number of pure line and hybrid strains were also under trial and some of them have appeared to be very promising.

A new irrigation experiment was started during the year and the sowing date and spacing experiments were continued. From the results obtained so far, the best time for sowing *43F* and *47F* appears to be the second fortnight of May.

56. *Physiological Scheme.*—Partial failures of the American cotton crop in the Punjab occurred in the years 1919 to 1921, 1926 to 1928, 1931 and 1932. The external symptoms of the cotton plants during these failures were early reddening and shedding of the leaves, premature opening of the bolls with immature seeds with low quality of lint and in extreme cases the dwarfing of the plant. To account for these failures various views were advanced like the heat stroke theory of Milne (1924), attack of white fly (Roberts, 1929) and unfavourable combination of climatic and biotic factors by Trought (1931); as these theories could not be supported with sufficient scientific data, it was thought that these failures were due to the malnutrition of the plant. As such failures of the cotton crop caused great financial losses both to the farmers and the Government, a Physiological Scheme was started in March 1935 to study the physiology of the cotton plant with a view to determining the nature of the nutritional disorder and the causes underlying it.

From the review of the work done on the problem and from the symptoms exhibited by plants during the failure years, it was first investigated whether the failure of the cotton plant was caused by the deficiency of any important mineral in the Punjab soils. In the first year, therefore, the following two lines of investigations were undertaken :—

(a) The effect of additions of minerals like iron, magnesium, and manganese on the growth and yield of the cotton plant was studied.

(b) A micro-chemical study of the internal tissues of the plant throughout the season in order to determine if the plants exhibited any internal symptoms of malnutrition.

The first line of investigation which was again repeated in the second year did not yield any information, while the second line of work brought out many abnormal features never described before for the cotton plant. The abnormal features were (1) breakdown of photosynthetic apparatus, (2) accumulation of starch in the leaves, roots and stems, and (3) the presence of cell deposits in the vital tissues of the leaves and the roots.

In addition, when the sterilised seeds and the tissues of the leaves and the roots of the cotton plant were cultured, a micro-organism developed in the culture media though no such organism could be seen in the cells of the plant or of the seed.

On studying the cotton plant in the field, plants showing reddening of the leaves and bad opening of the bolls were found in large numbers even in the good crop year of 1935 alongside the normal plants, and plants with green leaves were seen to produce bolls with immature seeds and low quality of lint.

During the second year (1936) the relation of micro-organism to the internal and external symptoms of the disease was studied and it was found by a very controlled series of experiments that these abnormal symptoms could not be reproduced by inoculations of pure cultures of these organisms into normal plants. The organism isolated from the 4*F* cotton seeds is identified as *Bacillus subtilis*.

Microscopic studies revealed that the chloroplasts were broken by the daily increase in the size of the starch grains which remained undissolved at night and ultimately ruptured the chloroplasts. The cell deposits in the leaves were made up of tannins and their derivatives. The diseased plants showed greater accumulation of calcium and organic acids in their roots than in the roots of the normal plants. The field observations indicated that the failing plants occurred in patches in fields.

These results indicated that some soil factor or factors were responsible for the malnutrition of the cotton plant. From the external symptoms, the internal symptoms and the occurrence of ' diseased ' plants in patches alongside normal plants, it was inferred that the balance of the mineral nutrition of the plant was upset in some way. It was, therefore, necessary to carry out investigations on the soils where ' diseased ' and normal plants occurred. It was also necessary to establish the relation between the time at which the internal symptoms appeared in the plant and the bad opening of its bolls. If the trouble was due to the soil, it required to be tested by trying to reproduce the symptoms of the ' disease ' by some treatment that may upset the normal metabolism of the plant.

During the third year (1937) all the internal and external symptoms of the ' disease ' have been reproduced in plants grown in good soils, by application of sodium chloride and sodium carbonate. The reddening of the leaves and their early shedding, the bad opening of the bolls with immature seeds with weak lint, the disintegration of chloroplasts and accumulation of tannins in leaves are reproduced in a varying degree in normal plants. This requires further confirmation next season. The appearance of the internal symptoms of ' disease ' is also established to precede the development of the external symptoms in the failing plants. It would thus be possible, by microscopic examination of the leaves, to know as early as August if the crop in a field is normal or ' diseased '. The investigations of the soils have so far shown that there are at least three soil types where the disease appears. They are (1) soils with alkaline sub-soil, (2) soils with compact and impermeable soil layers and (3) sandy soils. Any of the two types are found together in the same field occurring in different layers.

The growth and yields of plants depend upon the extent and the depth at which such soil conditions exist in a particular field. The ' disease ' appears in its serious form when either all the six feet of the soils are alkaline or sandy or when the lower layers of the sub-soil are either alkaline, compact or sandy.

The diseased condition of the plants in the sandy soils appears to be due to unbalanced nutrition and it has been found possible to reduce the symptoms of disease by application of nitrogen and phosphorus together. This experiment will have to be repeated.

Work on the above lines is being continued.

In accordance with the decision of the Committee at its meeting held in March 1937, the President of the Committee arranged with the Empire Cotton Growing Corporation for the loan of the services of Dr. T. G. Mason, F.R.S., to inspect and report on this important scheme.

57. *Pink and Spotted Boll-worm Scheme.*—The Committee sanctioned in 1926 a Pink Boll-worm Scheme with the object of ascertaining the causes responsible for the difference in the incidence of the pink boll-worm between the Canal Colonies, where it is practically absent, and the South-east Punjab, where its attack on cotton is severe. The Pink Boll-worm Scheme concluded in 1934 when it was replaced by the present combined scheme, viz., the Pink and Spotted Boll-worm Scheme, for the continuation of the work on the pink boll-worm and the investigation of certain economic aspects of the spotted boll-worm. The results of the Pink Boll-worm Scheme have been given in previous reports wherein it has been explained that the unequal distribution of the insect is mainly due to the difference in temperature and humidity in the various areas. The study of the spotted boll-worm pest has shown that, unlike the pink boll-worm pest, it is more severe at Lyallpur and Multan, representative of Canal Colonies and Western Punjab, than elsewhere. The

loss due to the pest was estimated, from the results of the night caging experiments, at 26 per cent. in *Desi* (local cotton and 10 per cent. in 4*F* American variety) in 1935 and 65 per cent. and 47 per cent., respectively, in 1934.

It has been stated in previous reports that in the Punjab, cotton sprouts from the previous year's stumps are the only source of food supply for the spotted boll-worm for about six weeks from the middle of April. Further survey of food plants has shown that while this observation holds good so far as the Canal Colonies are concerned, the same cannot be said of the south-eastern, central and submontane regions where, in addition to cotton sprouts other host plants, particularly *Malva parviflora*, *Abutilon indicum* and *Malvestrum tricuspidatum*, serve as breeding ground in the off-season. It is thus evident that any clean-up scheme for uprooting cotton stalks and stubbles to avoid the boll-worm pest is not likely to yield satisfactory results unless the other host plants are simultaneously dealt with. The Committee has accordingly sanctioned for this purpose a two-year Clean-up Campaign Scheme.

Of the three species of *Earias* (spotted boll-worm), viz., *insulana*, *fabia* and *cupreoviridis* met with in the Punjab, only the first two are cotton pests, the first being by far the commonest. *Insulana* is seen feeding on all host plants so far known in the Punjab while *fabia* is observed only on *Hibiscus esculentus* and rarely on other plants. *Insulana* and *fabia* remain active throughout the year while *cupreoviridis* hibernates in the form of pupa from October to April.

58. *White Fly Scheme.*—This scheme was started in 1931 with a view to study the life-history of the white fly (*Bemesia gossypiperda*), a small sucking insect that does damage to cotton and other crops. The scheme came to an end in September 1936 and the investigation has again confirmed the results already obtained on the seasonal history of the pest. *Bemesia gossypiperda* breeds practically all the year round, often parthenogenetically. There are no less than 44 species of plants both cultivated and wild on which the fly feeds. It makes its appearance on the new cottons early in May, soon after the crop has germinated but the attack is low. From June, however, the attack increases in intensity. At the commencement the attack is more severe on *Desi* varieties but from the middle of August the infestation increases on American varieties. The data collected have established the fact that the period of the severest attack on cotton extends from June to August after which the infestation, as a rule, declines abruptly. The incidence of attack on the early sown crop has been found to be comparatively higher up to September after which it is practically uniform on all the sowings. The intensity of attack is also higher on manured plants. During the period of severe infestation the vegetative growth is checked, and in serious cases may almost be stopped. Boll formation is reduced, lint percentage lowered and the plants affected adversely.

Control.—Predators and parasites have not shown any satisfactory means of control ; cultural methods like clean cultivation and safe disposal of alter-

native hosts in the no-cotton season go some way towards reducing the extent of the attack. Proper manuring at the right time may help the plants to recover from the damage caused by the fly.

Extensive spraying operations both on *Desi* and American cottons again proved to be very effective, the insecticides used being rosin soap, fish oil soap, tobacco decoction, kerosene oil emulsion and lime sulphur. Out of the above, rosin compound, proved to be the best. From the machines tested, cart sprayers proved useful as their working was very easy and economical. Hardie sprayer with a 2 h.p. motor pump gave very satisfactory results both with regard to the mortality of the pest and the cost of spraying. Cart sprayers, however, can only be worked when the crop is young. Orchard Power sprayer, though it gave the highest percentage of mortality, was found cumbersome and uneconomical.

The cost of spraying with rosin compound amounted to Rs. 1-12-4 per acre with the Sapom, Rs. 1-7-8 with the Hardie and Rs. 2-9-9 with the Orchard Power sprayer during 1934. It is possible, however, to reduce the cost still further by more economical methods. Spraying *Desi* cottons during the month of July and American cotton during August increased the yield. It was determined that spraying must be done before flowers appear.

59. *Root Rot Scheme.*—This scheme commenced in 1932 for the investigation of root rot in the Punjab, where, particularly in the canal-irrigated areas, the annual damage done to cotton by this disease is estimated at Rs. 16 lakhs. Both *Desi* and American varieties are equally affected by the disease which makes its appearance towards the end of June when the crop is 6 to 8 weeks old, and continues up to the middle of September. Rain-fed cottons, however, are not affected and the activity of the disease increases in proportion to the amount of irrigation or soil moisture. The work of the year shows that organisms *Rizoctonia bataticola* and *Rizoctonia solani* are most active in June and July and do maximum damage to the May sown crop. These organisms are present on the roots and are carried over from year to year in live as well as decayed roots unlike American root rot fungus which lives only in live roots.

None of the varieties so far tested, viz., *L.S.S.*, 43*F*, 45*F*, 4*F*, *Mollisoni* 15 and *Jubilee* cotton, are resistant to the disease, and attempts are being made to select resistant types from the local crop of American and *Desi* cotton. The application of fertilisers has not given any encouraging results and the chemical analysis of the infected and uninfected soils shows no difference except in CaO/MgO ratio which is higher in the latter than in the former.

60. *Scheme for Defibrating and Delinting Plant.*—This scheme was sanctioned in August 1933 and the two machines were installed in 1934 at the British Cotton Growing Associastion' ginning factory at Khanewal. Due to some defect in it, the defibrating machine could not be set right. From the results obtained on this machine at the British Oil and Cake Mills, Rochester,

to which 50 tons of 289*F* seed were shipped by the suppliers of the machine, it appears that this variety of seed can be successfully defibrated but the Rochester report shows that the variation in the size of the seeds is the fundamental cause of the trouble and defects experienced. The removal of this defect is not an easy matter and the variation in the size of the seeds must be accepted as a normal factor. Another point brought out in the report is that the defibrator is not designed to remove more than about 2 per cent. of fuzz while as estimated by sulphuric acid treatment, the amount of fuzz on 289*F* is as high as about 12.8 per cent. It is stated that the defibrated seed can be sold in the market only at a big discount and the grade of the fuzz is so low that it is unfit for sale.

With regard to tests carried on with the delinting machine, delinting was done in three degrees of polish, light, intermediate and high. With very light polish the machine turns out two maunds of seeds per hour and removes 5.3 per cent. of linters, with intermediate polish one maund of seed per hour and 7.5 per cent. of linters and with high polish 0.58 maunds of seed per hour and 8.7 per cent. of linters. As regards the economics of the working of the delinting machine, without taking the cost of power, interest on capital outlay, depreciation and the cost of repairs into consideration, light delinting leads to an apparent loss of three pies, intermediate delinting to a gain of Re. 0-2-1 and high delinting to a gain of Re. 0-2-2 per maund of seed delinted.

As the results have not been of any economic value, the scheme has since been closed down.

CENTRAL PROVINCES.

61. *The Botanical Scheme* is one of the earliest schemes of the Committee and was commenced in 1923. The main work under this scheme is concerned with the breeding of new strains of cotton suitable to the conditions obtaining in the various cotton growing areas of the provinces and especially capable of resisting the handicaps imposed by wilt and other diseases. In addition, only such other crops are worked at, as experience has shown to be suitable rotation crops for making the growing of cotton a permanent success. As the Department of Agriculture had already done some work on cotton breeding prior to the starting of this scheme, it was possible to produce, earlier than otherwise, wilt-resistant strain known as *Verum* 262, which seemed to be admirably suited to the requirements of the moment. It was, however, soon found that this strain was susceptible to adverse climatic conditions and attention was, therefore, directed to the breeding of new strains free from this defect and, if possible, with better economic characters. These objects have, to a very large extent, been achieved, and it is now only a matter of a few years before *Verum* 262 is almost completely replaced by the newly developed all-round strain, *V.* 434. This strain has been tested in the various cotton tracts of the province under a wide range of conditions and markedly contrasting seasons. These tests have shown beyond doubt that this strain is the best all-round type available at present—hardy, prolific and superior in lint.

The production of medium or long stapled cottons that would spin higher counts than 20's is being aimed at in the Central Provinces in accordance with the policy approved by the Indian Central Cotton Committee and the Agricultural Department to replace at least the greater proportion of the existing coarse cottons by varieties that can compete in the world market.

The chief activity during the year was concerned with the testing, multiplication and expansion of the newly developed strain, *V.* 434. But while the progress in expansion of this strain was watched in the field, breeding work, with the object of producing still better varieties, was steadily pursued in other cottons. There were some 20,000 acres under *V.* 434 during the year, and once again it proved to be the best all-round strain, with remarkable adaptability to varying climatic conditions. Another characteristic revealed by this strain was the tenacity of its burst bolls to withstand heavy rain and gale without dropping on the ground like the coarser varieties. In spinning capacity, this strain maintained practically the same performance as during the past four years. A representative sample of it was, as usual, sent to the Technological Laboratory, Matunga, along with other approved cottons. Amongst these *V.* 434 gave the best spinning performance, *Late Verum* following close behind. From its yarn-strength results, it was adjudged suitable for spinning up to 33 highest standard warp counts. Under large-scale trials, this strain gave an average yield of 589 lbs. per acre which, in view of the contrasting climatic conditions during the growing season, must be considered very satisfactory. The yields during the previous three years were 589, 635 and 475 lbs. respectively. The area under *V.* 434 in the coming season is expected to be in the neighbourhood of 200,000 acres.

Late Verum was again tested in areas for which it has been specially developed and the results obtained were in keeping with those of the previous years. But owing to the all-round suitability of *V.* 434 and the advantage of having as few types as possible under cultivation in adjacent areas, it is recommended that, except in places where *Late Verum* shows a distinct advantage over *V.* 434, the latter type is the one that should be grown.

No. 438, another recently developed strain, was tried on an extensive scale and did very well on the lighter description of soils, in the cotton tracts of Nimar and Buldana, bordering the Tapti and Poorna valleys. This strain has the same length of staple as *V.* 434, and spinning tests show that it has maintained its performance of the past three years, being adjudged suitable for spinning up to 34 highest standard warp counts.

Work on the two *Banis, E.B.* 31 and 306, was continued. A wilt-resistant strain in the narrow-lobed type obtained from *E.B.* 31 has now been isolated and attention in future will be concentrated on this and the rest of the material will be discarded. It is a high-yielding type, but it still remains to be seen whether the extra yield obtained compensates for its low ginning percentage which ranges round 27 to 28. *Bani* 306 no

longer suffers from the defects which caused the extinction of the old Hinganghat. It resists wilt disease and ripens about the same time as the *neglectums*. The ginning percentage too has been considerably improved. But until the quality of cotton, and not the ginning outturn, becomes the basis of valuation, there is little chance of extension of area under such superior cottons.

Another aspect of the work during the year has been the continuance of the examination of the possibilities of *Buri* (acclimatised *G. hirsutum*). *Buri* yields well in years of ample rainfall and does not suffer from wilt disease. The conditions during the past three years have been very favourable for it and the two strains, *Buri Ak-Special* and *Buri* 107, especially developed for an area of some 50,000 acres in and around Burhanpur in the Nimar district, have met with much favour and a considerable demand for their seed has sprung up.

The more recent selection work has, among other things, aimed at improving the *Verum* types in the direction of increased strength to fortify the plants against the strain imposed upon them through carrying a heavy crop. The new isolations will be tested against the parent stock in this respect in the coming season.

The chief feature of the year was the development, to the field-scale stage, of four new strains of cotton, viz., *B*.90, *B*.64, *B*.73 and *B*.61. These four strains have been bred from the wilt-resistant stock of *Gossypium indicum* and their selection has been considerably facilitated by the technique of the ' Purity Chequer ' method. They combine fineness of the lint with high yield and freedom from disease. Arrangements have been made for their comparative trials on a field scale at the various Goverment Farms and on land of a few private growers in the coming season and it is anticipated that their performance will justify the confidence placed in them.

Hybridisation work in cotton was continued, its object being to produce, if possible, new forms of economic value and to study the mode of inheritance of certain characters in the cotton plant. Work on *Bani* × *Cernuum* cross was continued and a few useful strains were compared with each other and further selection made.

Progress was also maintained in the physiological work which includes the study of the effects of various cultural and manurial treatments and meteorological conditions upon the growth and development of the cotton plant.

Steady progress was also maintained in the work on rotation crops. *AK* 12-24, which was introduced four years ago, has now become the most popular variety of groundnut in Berar and there has been a marked expansion in the area under it. Further work with rotation experiments has confirmed the results already obtained, and there is now no hesitation in

recommending the three-course rotation consisting of cotton, juar and groundnut as being the most profitable one for Berar from the points of view of cotton yields and land fertility.

62. *Entomological Scheme.*—This scheme, which was sanctioned in January 1934, commenced work in July 1934. It has for its object the preliminary survey of cotton boll-worm pest in the Central Provinces and Berar with a view to ascertaining its incidence, method of carry-over and the extent to which the results obtained from the Surat Boll-worm Clean-up Scheme can be utilised in these provinces. During the year under report, the three types of boll-worms, viz., the Spotted Boll-worm (*Earias fabia*), the Pink Boll-worm (*Platyedra gossypiella*) and the Cotton Boll-worm of America, locally known as the gram caterpillar (*Heliothis (chloridea) obsoleta*) which cause a certain amount of damage to the cotton crop of the province were further studied at Akola and Nagpur. The first attack of the Spotted Boll-worm was recorded in the middle of July and the highest percentage, viz., 18.8, both at Nagpur and Akola, was reached during the period from the middle of October to the middle of November. During the first fortnight of October, the big bolls were found attacked to the extent of 12.3 per cent. and 2.5 per cent. by the Pink Boll-worm. The difference between the two attacks is that at Akola the attack was highest when the number of big size green bolls on the plants was the largest while at Nagpur it was highest when the number of big size bolls had declined.

The Pink Boll-worm, on the other hand, has been found to be a serious pest in the Central Provinces and Berar. At Akola its attack commenced from the beginning of October and reached its highest level during November, while at Nagpur it commenced a week later and never went beyond 2.15 per cent. Thus the Pink Boll-worm causes more damage at Akola than at Nagpur.

The yield of *kapas* in the absence of boll-worms was determined by 'night caging' method at both places and it was found that the increase in the outturn of *kapas* was 49.6 per cent. by weight. 92 per cent. good locks were obtained from protected plants against 70.6 per cent. from non-caged plants.

The removal and destruction of the shed forms every morning when there was wind without rain during the previous night was tried in the previous season both at Nagpur and Akola on small-scale plots. During the present year the experiment was repeated on a field scale and the results have shown that timely removal and destruction of the fallen forms during the period from October to the end of December helps to check the activities of the boll-worms.

Observations to determine the time of emergence of Pink Boll-worm moths from stored *kapas* and cotton seed were made both at Akola and Nagpur. At Akola the emergence of Pink Boll-worm moths was found

up to April and after that no moth was found to have successfully emerged. On the other hand, dead larvæ of pink boll-worm were found during July, showing that the pest was not able to stand the heat during May and June. At Nagpur some moths did emerge both from *kapas* and cotton seed during July and August.

The gram caterpillar (*Heliothis obsoleta*) was hitherto unknown in India. It was met with for the first time last year, when it was found that the damage done by it to cotton in Berar is as serious as by the other two boll-worms. Its life-history and habits were therefore studied during the year under report. It was found to be very active during the months of December, January and February. During this period it feeds on a number of different species of plants and its population is considerably high. In the laboratory it was observed that the insect hibernates in the pupal stage during the period from November to March and after that period it breeds continuously. As the alternative host plants get dried up during the hot weather except Rose and *Bhindi* (*Hibiscus esculentus*), a more thorough study of this position during these months is needed to see how the pest continues its existence.

The position of the boll-worm pest in the Central Provinces and Berar is about the same as in Gujerat and it is suggested that the only practical way of controlling it would be to adopt clean-up measures similar to those adopted in Gujerat, viz., the uprooting of cotton stalks and stubbles and eradication of alternative host plants as early as possible after the harvest of cotton.

United Provinces.

63. *The Cotton Survey Scheme* was started in 1933 with a view to carry out a detailed survey of the Bengals types of cotton grown in Rohilkhand and Bundelkhand to facilitate the selection of suitable types of cotton for the different cotton growing areas of the province.

About 23,000 samples of cotton have been collected from the two large and most important cotton growing tracts of Rohilkhand and Bundelkhand, including some half a dozen Indian States. Preliminary observations have indicated a range of sub-forms under each of the established and recognised types of *Gossypium neglectum, Bengalensis, Roseum, Malvensis* and *Cutchica.*

Promising material from the survey has been obtained and should prove useful in connection with work for retaining suitable cotton types for the provinces.

Bengal.

64. *The Comilla Cotton Scheme.*—This scheme, which was sanctioned in February 1933, came into operation in December 1934. It has for its object the botanical and systematic study and improvement of the commercial grade of *Cernuum* cotton. The work of the year mainly consisted of testing single plant cultures selected on the merits of their performance last year. Trials on 24 samples of cotton collected from Assam, Bengal,

Cawnpore, Jalgaon, Indore and China were made for the first time but as there were heavy and continuous rains immediately after sowing, the crop failed altogether.

Field and laboratory tests of each single plant were undertaken to study there different botanical characters. Selfing of flower buds was done but the number of selfed bolls obtained was low, due probably to very heavy rains.

BURMA.

65. *The Cotton Improvement Scheme* in Burma was started in April 1931, with the object of bringing home to the cultivators of the Wagale tract, by means of practical demonstrations, better methods of cotton cultivation. The scheme has fulfilled the objects aimed at, and has now closed down. The main items of improvement brought about lay in the following directions :—

(1) the lay-out of a system of narrow-based ridges as an anti-erosion and moisture conservation measure, (2) the making and storing of farm-yard manure, (3) the use of improved ploughs, and (4) line sowing of crops with inter-cultivation.

HYDERABAD.

66. *The Botanical Research Scheme at Parbhani* commenced in 1929, with a view to obtaining a few prolific, high ginning, uniform types of cotton, with good spinning qualities, to replace the present mixture of *Gaorani* cotton in Hyderabad State. *Gaorani* or *Bani* is probably the best of the indigenous cottons in respect of spinning. It is, however, both a poor yielder and a poor ginner. In addition to the testing of new strains and progenies and the propagation of selfed and first generation seed of the most promising strains, the work during the year also included the growing of rotation crops.

Preliminary tests on 199 new selections of medium staple *Gaorani* and 70 selections with slightly shorter staple were carried out at the Cotton Research Station, Parbhani; the former for the purpose of producing an improved strain for the *Gaorani* tract, and the latter to breed a strain that may ultimately be capable of replacing short staple existing mixture of Parbhani and Aurangabad Districts. *G.*4 was adopted as 'control' for medium staple selections and *Havri* 3 for short staple ones. Out of these selections, 35 medium staple and 7 short staple progenies were picked plant by plant and about a dozen and a half were finally selected for further strain tests. 22, *F*2 progenies of crosses between *Havri* 3 (*rosea*) and improved *Gaorani* strains were grown and studied. Of the 8, *F*3 and 16, *F*4 progenies, grown in preliminary tests, only one was selected for inclusion in comparative tests in the next season. Out of 1,000 fresh single plants selected from cultivators' fields, in different localities, and from crops in the villages in the districts of Parbhani and Aurangabad, only 300 were retained for growing in the next season, after examination of their seed and fibre characters.

Flowering, bolling and shedding records were collected at Parbhani for 10 plants of each of the 3 strains, *G*4, *G*6 and *Havri* 3, for further study.

There were two varietal tests ; the first experiment was conducted with *Gaorani Local* and 4 strains, viz., *Gaorani* 3 *B*-1, *Gaorani* 4, *Gaorani* 6 and *Gaorani* 58*E* on three sites at the Government Experimental Farm, Parbhani, and on one site each at the Variety Testing Stations, Latur and Mudhol. These tests have shown that *G*.4 and *G*.6 gave higher yields than the Local at two sites. *G*. 3*B*-1 gave the highest yield at Mudhol, and significantly higher yields at all the 3 sites, while *G*.58*E* gave higher yield than the local variety at only one site.

The second varietal test was conducted with the local variety of Parbhani with the 4 strains *G*.1*A*, *G*.12*F*, *P*.26 *H* and *Havri* 3 at the Government Experimental Farm, Parbhani. *Havri* 3 gave the highest yield but the difference in its yield and that of the local variety was not significant. *G*.1*A* and *P*.26*H* gave significantly lower yields, while *G*.12*F* gave a slightly lower yield than the *Local*. The difference in yield, however, was not significant. There were two other similar tests between new and old strains and the results show that all the strains gave significantly higher yields than *Gaorani Umri* and *Parbhani Local*.

A comparative test with 27 medium staple strains and *G*. *Umri* was also conducted. 23 of these gave higher yields than *Gaorani*, but the differences were significant in the case of 13 strains only. As compared with *Gaorani* 4*B*, the leading *Gaorani* strain of the past three years, 16 strains were better yielders but the differences were significant only in the case of two strains, viz., *G*.115 and *G*.58*A*-1.

Other work included the study of resistance to wilt and the purity of new strains, the maintenance of types in pure cultures and district trials. Seed of *G*.6 was sown over 25¼ acres at the Government Experimental Farm, Parbhani, and yielded 520 lbs. of seed cotton per acre. 3rd and 4th generation seed of this strain was sown on about 4,986 acres at Karkheli and surrounding villages in Mudhol taluka of Nanded district. The average yield was 182 lbs. of *kapas*. Seed cotton of *G*.6 fetched a premium of Rs. 5-8 per *khandi* of 960 pounds. The lint also fetched a higher price than the lint of local types. Seed sufficient to cover 50,000 acres has been collected and its distribution is in progress.

Trial of American varieties like 4 *Punjab-American*, 3 *Sind* and 13 *Cambodia* strains and 52 single plant progenies of *Parbhani-American* 1 was also undertaken. Punjab and Sind strains were early and prolific but more susceptible to jassids. *Cambodias* matured very late and suffered heavily from boll-worm attack and gave lower yield, whereas *Parbhani-American*, which was found jassid-resistant, gave good yields.

67. *Pink and Spotted Boll-worm Scheme.*—This scheme was started in January 1933 with a view to ascertain (*a*) the actual amount of damage done to cotton in the Godavary valley by the boll-worm pest, (*b*) the progress of its attack on the growing crop, (*c*) the mode of its carry-over from season to season and (*d*) the effect of the likely control measures. The work of the year was in a large measure a repetition of the work done before and consisted of observations on the progress of boll-worm attack during the season, estimation of the damage done, and the study of the life-histories of the two boll-worms were continued.

The results of the year confirm the observations made in previous years, viz., that the Spotted Boll-worm is practically never absent and rapidly increases in number in September and during greater part of October. There is then a decline before it starts to increase again. It lives during the off-season on cotton plants left over in fields and on alternative host plants and pupates in cotton and other food plants, in their shed parts and in the soil. The damage done by this pest during the year amounted to 5.5 per cent. of *kapas* at Parbhani and 4 per cent. at Nanded.

The Pink Boll-worm pest makes its first appearance from June onward and reaches its maximum incidence in January-February, when it begins to decrease till it becomes negligible about the end of April. It continues as short cycle larvæ on " stand-over cotton " till the beginning of May. Thereafter it spends a short time in the quiescent stage and emerges as long cycle moth on the return of favourable weather after the setting in of the south-west monsoon. The long cycle moth finds ready breeding ground in the previous year's crop still left in the fields in many localities due to the local practice of delaying the annual leases of cultivated land till the middle of April. The Pink Boll-worm passes its resting stage in the stored seed cotton and in the soil and, unlike in the United Provinces, it does not survive in the stored seed. The damage done by this insect during the year was estimated at 21.8 per cent. of *kapas* at Parbhani and 18.5 per cent. at Nanded.

The percentage of clean cotton at Parbhani was higher than in the previous year. The estimated crop loss due to the boll-worms was, however, not less than 20 per cent. The estimated damage to seed varied from 8 to 28 per cent. in the cultivator's crop and from 13 to 42 per cent. at the Government farm. The seed of the early maturing *Gaorani* 6 showed the least injury. From an examination of the soil in April, 5 living larvæ, 4 pupæ, and 3 freshly emerged moths were recovered. The lower ' carry-over ' during the year was attributable to the early emergence of moths that followed the unusual rains from February to May.

Only a few larvæ from bolls and the surrounding soil were recovered from buried bolls in April. Effect of 6 inches of fine mulch of soil on full-grown Pink Boll-worm larvæ showed a high rate of mortality in the buried larvæ.

Observations on the life-history of Pink Boll-worm showed that under laboratory conditions long cycle moths had an average life of about 30 days and some as many as 69 days. From the 'carry-over' studies of the past three years, it appears that complete removal of cotton stalks soon after final picking, completion of cotton ginning before 1st May and the prohibition of the growing of *Bhendi* in the hot weather will go a long way towards checking this pest. Growing an early maturing variety is another means of reducing the damage done by the pest.

68. *Cotton Survey Scheme.*—This scheme started in June 1931 and closed down in June 1936. The objects were (1) to collect and test, on a central farm, the types of cotton grown in the State, and (2) to determine the proportion of different varieties of cotton in the crop of the various parts of the State.

Small samples of seed were obtained from well scattered and representative villages of each cotton growing district. These were sown each separately at the Government Experimental Farm, Parbhani, or Rudroor (Nizamabad district) according to their season (Autumn harvested or Spring harvested). Nearly 200 plants of each sample were classified into different botanical species and varieties. The total number of samples studied in 5 years was 971. In addition, 200 plants in each survey number from cultivators' fields, representative of the standing crop, were collected and classified according to different varieties.

The survey has been very complete and has accomplished the object for which it was started. The results obtained are summarised below :—

Botanical.—Gossypium neglectum var. *rosea* predominates in the districts of Aurangabad and Parbhani, and in parts of Bhir, Osmanabad and Adilabad districts, whereas *Gossypium neglectum* var. *cutchica* is the chief component of the *Mungari* crop of Karnatak districts.

Gossypium indicum is the principal predominating type in Nanded and Bidar districts and parts of Adilabad, Bhir and Osmanabad districts and also in Karimnagar, and northern part of Warangal and eastern half of Adilabad districts.

Gossypium herbaceum forms the bulk of the *hingari* crop of Karnatak, and the *rabi* crop of Nizamabad, Karimnagar and Warangal districts.

Gossypium obtusifolium var. *Coconada* forms the chief constituent of the crop of Nalgonda and southern part of Warangal district.

Gossypium hirsutum is present in varying proportions in the crop of a major part of the cotton tract, and in some villages it is grown almost pure.

Commercial.

Hyderabad Oomras cover over two million acres and total 300,000 bales annually. The cotton is short stapled and coarse and fit for spinning 8-12's

counts. Most of this cotton is exported. Very little botanical work has been done for the improvement of this variety.

Hyderabad Gaorani covers about 900,000 acres and its annual production amounts to about 110,000 bales. It is one of the finest Indian cottons and is much liked by the Indian mills. It is fit for 24-30's warp counts. Only two to three thousand bales are exported annually out of India. Nearly 8,000 acres will be under improved strains of this variety in 1936-37.

Southerns, also known as *Kumptas*, cover about 400,000 acres every year, producing about 50,000 bales. The staple length is $\frac{3}{4}$th inch to $\frac{7}{8}$th inch and the fibre is fit for spinning 20-24's counts.

Coconadas cover about 20,000 acres only and their annual production amounts to about 2,500 bales. It is a low ginning type. The fibre is dark coloured and fit for 16-20's warp counts. No botanical work has been done with this cotton so far.

BARODA.

69. *The Root Rot Scheme*, which was sanctioned in July 1931, commenced work in February 1932, with the double object of studying the root rot disease and securing a few suitable strains of cotton which are resistant to this disease. The work of the previous years has shown that the disease is less severe in years of normal rainfall than in years of heavy rainfall and also in late sown crop than in early sown crop. The affected cotton roots contain the organisms of *Macrophomina phaseoli* and *Nematodes*. Infection trials were made with these organisms on seed in glass-house and it was observed that a mixture of these two produced a heavy mortality than when either was used singly. A series of trials was made with *B.* 9 seed and its survivals will be transplanted in fields heavily infected by the organisms. Several chemicals and disinfectants were used against *Sclerotia* (resting spores) resistance, but the results obtained require further confirmation.

Manurial and disinfecting treatments were tried on a field scale with different quantities of manure per acre but none of the treatments was significantly better than the control. It seems that no manure is effective against root rot, sulphur treatment also is not of much use in checking or reducing the root rot mortality effectively. On the botanical side, replicated progeny test of *K.S.* was tested for root-rot resistance and 5 plants from each progeny showing higher resistance, yield and best economical characters have been selected for further trial. *No.* 8 and *B.S.* were similarly tried in replicated progeny rows, but the results were not satisfactory except one plant of *B. S.* which was found unaffected. The produce of this plant has been carefully saved for further trial next year.

Under non-replicated progeny trials, 48 individual strains were grown with *Broach* 9 as control and 17 strains have been selected for further trials. Four promising varieties, viz., *K.S.*, *No.* 8+*B. S.*, *D. S.* and *B.* 9, were tried

for root resistance and it was found that *K. S.* was more resistant than the rest of the varieties. Future breeding work will, therefore, be concentrated on *K. S.* material.

70. *The Goghari Cotton Survey Scheme* is similar to the Goghari Cotton Survey Scheme in the Bombay Presidency and has for its object the survey of *Goghari* cotton crop in Baroda State, with a view to tracing the produce to ginneries and to inducing the gin-owners to gin it separately and dispose of the seed for cattle food. During the year under report, the survey was confined to the same Navsari tract. The total area surveyed during the year amounted to 63,372 *bighas* against 55,012 *bighas* of last year. Only $\frac{1}{4}$ per cent. of this area contained a small mixture of *Goghari* not exceeding 5 per cent. while the rest of the area was practically pure. A sustained propaganda by the Agricultural Department, combined with the activities of the cotton survey staff and the passing of the Cotton Control Act were mainly responsible for suppressing the evil of mixing in fields *Goghari* with pure cotton.

71. *Plant Puller Propaganda Scheme.*—This scheme commenced in January 1936. It is similar to the Plant Puller Propaganda Scheme in Bombay Gujerat and is meant to popularise the cotton plant puller, a cheap and effective implement for uprooting cotton stalks and stubbles and thus encourage the cultivators to fight against the boll-worm pest by cleaning up their cotton fields as soon as the last pickings of *kapas* are over. The work was started in Baroda and Navsari districts on the same lines as in Broach and Surat districts of the Bombay Presidency. During the year under report, the number of plant pullers sold in Navsari district was 1,563 as against 577 in the previous year. In Baroda 4,012 were sold against 3,198 last year. Propaganda was carried by magic-lantern lectures and other means and from the results achieved it is obvious that further propaganda would result in still more extended use of plant pullers.

Bikaner.

72. *Bengals Cotton Improvement Scheme.*—The opening of the Gang Canal under the Sutlej Valley Scheme resulted in the colonization of a new and virgin area, known as the Gang Canal area, with immigrant peasants mostly from the Punjab who had been accustomed to the cultivation of the Punjab *Desi* and American types of cotton. The cultivators found it difficult to successfully cultivate cotton under local conditions, evidently because the new environment was not quite the same as they were accustomed to in the Punjab. It was even feared that the area under cotton would be seriously reduced. This scheme was, therefore, started in January 1931, for the purpose of studying the local problems of the agriculturists and for obtaining by selection and hybridisation one or more superior types of cotton suitable for the locality.

During the year under review, the U.P. strain *C.* 520, which had proved most suitable among the *Desi* types for the tract, was found defective in

germination due to rigorous climatic conditions and further selections were made in it and grown in progeny rows. Five best families which had the best germination were selected for further trials. 36 good plants from *F*5 hybrids of *C.* 520 x *Bani*, were selected and examined for lint length and ginning percentage. The best 10 of these were retained for further trials. The trials of Asiatic-American hybrids, which did not give satisfactory results, have been given up. Experiments on six types of American cotton from the Punjab and two *desi* types, *C.* 520 and *Malvi* 9, were conducted both in the light and heavy *ghaggar* bed soils with different irrigations. In the light soils, the American cotton, *P.* 289*F*, gave the heaviest yield and among *Desi* cottons *C.* 520 was about the best. Difference in irrigation had no effect on staple length. The season happened to be particularly favourable for the American cottons. Thinning experiments were conducted to determine the effect of thinning on yield but it was found that though individual plants gave an increased yield in the thinned area, the value of this yield was only just enough to meet the labour charges for thinning, thus proving that thinning was uneconomical.

MYSORE.

73. *Doddahathi* (*American*) *Cotton Scheme.*—This scheme, which was sanctioned in February 1935, commenced work in November 1935. It has for its object the breeding of suitable types from the local *Doddahathi* or American cotton resistant to " Red Leaf " disease which stands in the way of the expansion of this crop in the Irwin Canal area in Mysore State. The work of the year indicates that certain varieties, like *Sea Island, Boss III*-16 and *Acala* are more susceptible to " Red Leaf " disease than other varieties like *Co.* 2, *M. A. II, N. T.* 38 or 38 *F.* A large number of crosses were made with exotic varieties and their progenies will be tested next year.

Varietal tests have shown that 4*F*-98, Sind *Sudhar, Gadag No. I, M.A. II, N. T.* 38 (38*F*) and *Co.* 2 give promising yields under irrigated conditions at the Irwin Canal Farm while local *Doddahathi, Gadag No. I, Co.* 2, *M.A. II, N.T.* 38 (38*F*) give better yields than *M.A. I, Sea Island,* 43*F, Boss III*-16 and Sind *Sudhar* under rain-fed conditions at the Hebbal Farm.

In the sowing date trials, *M.A. II*, Sind *Sudhar*, and *N. T.* 38 (38*F*) gave best results when they were sown on the 1st June, 15th June and 15th May, respectively.

74. *Tour in Iran to collect Herbaceum cottons.*—In connection with the examination of the possibility of growing medium or long staple cotton in the present short staple areas of India, it was ascertained that no work had hitherto been done for the large Dholleras tract. With a view to find out a medium or long staple cotton suitable for this tract, a member of the staff of the Institute of Plant Industry, Indore, was sent on a tour to Iran to collect Iranian (*herbaceum*) cottons for study along with Indian cottons. The tour has been successful and the collector has brought back about 1,400 seed samples from individual plants.

The best material of *G. herbaceum* was obtained from the eastern districts visited. Good material was also found in western Iran, but that collected in the north was inferior. The indigenous cottons exhibit great variability in ginning percentage, lint length and lint fineness. The introduced cottons were variable in the first two characters only.

The *herbaceums* met with in Iran were all sympodial. To hasten maturity, it is a general practice in Iran, particularly in the eastern area, to pluck the leaves and top the stem of the plants.

Of the material collected, some of the *hirsutums* have been sent to the Cotton Research Botanist, Punjab, and some to the Cotton Specialist, Coimbatore; of the *herbaceums*, some have been sent to the Cotton Specialist, Coimbatore, and the remainder to the Cotton Botanist, North Gujerat, Viramgam.

75. *The Joint Scheme for the estimation of effects on cotton crop of the use of plant puller in Bombay Presidency and Baroda State,* which was sanctioned in August 1936, came into operation in December 1936. The object of the scheme is to obtain an exact or nearly as exact as possible an estimate of the benefits derived from the use of the plant puller. The work was carried on both in Bombay Gujerat and Baroda State. The results give indications that pulling is advantageous. Climatic conditions were, however, peculiar so that precise estimation of the effect could not be made. The work will be repeated.

CHAPTER V.

SEED DISTRIBUTION AND EXTENSION SCHEMES.

76. During the first five years of its existence, the Committee devoted itself chiefly to botanical and other research on cotton, but in 1929 it felt that if its work was to be of practical benefit, the results obtained by research should be made easily available to the cultivator. In this year, therefore, the Committee adopted the policy of helping Agricultural Departments and Co-operative Sale Societies in the more extended distribution of pure seed of improved varieties of cotton. The year under review began with 12 seed distribution and extension schemes. In addition to these, two new schemes were sanctioned during the year for the maintenance of nuclei of pure seed of approved varieties of cotton in the Bombay Presidency and Sind. A short account of the various Seed Distribution and Extension Schemes is given in the following paragraphs.

MADRAS.

77. *Tiruppur and Co.* 2 (*Cambodia*) *Schemes.*—The Madras (Tiruppur) Seed Extension Scheme was sanctioned in 1929 for a period of five years with the object of providing for the pay of an officer to act as an adviser to a group of Co-operative Societies in Coimbatore district which were growing improved strains of Cambodia cotton and also to help the Agricultural Department in their seed distribution work. It started work in May 1931 and was extended in June 1936 for a short period of three months. This scheme was amalgamated in 1933 with a new scheme known as the Tiruppur *Co.* 2 (*Cambodia*) Seed Extension Scheme which was sanctioned in August 1932 for a period of five years for the distribution of *Co.* 2 seed in the Salem and Coimbatore districts through the agency of the Madras Agricultural Department and the Tiruppur Co-operative Trading Society. The object of the second scheme was the maintenance by the Agricultural Department with a grant from the Committee of a seed multiplication area of not less than 6,000 acres, and the distribution by the Society to the cultivators of the pure seed produced in this area for 100,000 acres. The Committee has further guaranteed the Tiruppur Co-operative Trading Society its actual loss on seed transactions up to a maximum of 10 per cent. of the capital invested for the purchase of seed and interest thereon at 5 per cent. Of the total quantity of 1,066,780 lbs. of pure seed obtained in 1935-36 from the multiplication area and selected cultivators, 904,344 lbs., enough to sow on 30,000 acres, were distributed to the cultivators, the rest being left unsold. During the year, the Department of Agriculture issued pure seed for 6,588 acres of seed multiplication area, but owing to insufficient rains at the time of sowing, a higher seed rate of 30 to 35 lbs. per acre had to be used and the area actually sown was therefore reduced to 5,117 acres. In addition, the area

covered by the natural spread of *Co.* 2 seed was estimated at 150,000 acres against 120,000 acres during 1935-36. It is thus evident that *Co.* 2 is favoured both by the *ryots* and the merchants.

BOMBAY.

78. *Revised Jayawant and Gadag No.* 1 *Scheme.*—This scheme, which replaced the then existing five seed schemes in the Southern Division, viz., Hubli, Gadag, Athani, Haveri and Bailhongal, commenced work on the 1st June 1936. Twenty-five per cent. of the net cost of the scheme excluding savings from the original five seed schemes is being borne by the Bombay Government. The scheme is designed to embrace not only the areas covered by the five schemes mentioned above but also other areas in Dharwar, Belgaum and Bijapur districts, for which there were no specific schemes. The scheme is operated from seven centres, viz., Hubli, Haveri, Navalgund, Bailhongal, Athani, Bijapur and Bagalkot, through the agency of Co-operative Societies but under the general control of the Agricultural Department. The keynote of the scheme is decentralization so that no single agency should have too great an area to cover or too great a responsibility to carry. The scheme is intended to cover, within five years, 9½ lakhs of acres. During the year under report, 961,100 lbs. of pure *Jayawant* seed and 844,100 lbs. of *Gadag No.* 1 seed were distributed over 102,306 and 84,410 acres, respectively. 17,918 bags (25,08,520 lbs.) of *Jayawant* seed sufficient for about 2½ lakhs of acres and 9,410 bags (941,000 lbs.) of *Gadag No.* 1 seed sufficient for about 94,100 acres have been stocked for 1937-38 season.

79. *The Surat Scheme* was sanctioned in 1929 for two years and extended for two more years in 1931, pending the decision of the Committee on the merits of the two rival varieties, 1027 *A.L.F.* and 1*A*. In January 1934, the Committee finally decided to confine its attention to the distribution of 1027 *A.L.F* and extended the scheme for five more years. The scheme will thus continue till March 1939. During the year under review, the Department of Agriculture arranged for a large seed multiplication area of 25,583 acres and distributed 1,209,063 lbs. of 1027 *A.L.F.* seed in the Surat-Broach area, besides supplying another 1,477,946 lbs. to Rajpipla and other States.

80. *Khandesh* (*Banilla*) *Scheme.*—This scheme, having for its object the extension of *Banilla* cotton in the Khandesh area, was sanctioned in December 1930 for a period of five years and commenced work in May 1931. It was extended in January 1936 for a period of one year and closed down on the 30th April 1937. During the year a total estimated area of 66,000 acres, including 33,042 acres under natural spread, was covered by the scheme, against 130,000 acres, including 77,688 acres under natural spread, last year. The gain to the cultivators from the scheme during the six years of its operation is estimated to be nearly Rs. 4,50,000 at the rate of Re. 1 per acre for the entire period. The scheme has since been replaced by the Khandesh (*Jarila*) Scheme detailed in the following paragraph.

81. *Khandesh (Jarila) Scheme.*—As a result of breeding work on *Verum* cotton at the Jalgaon Farm, the Agricultural Department has been successful in obtaining a new *Verum* selection, known as *N. V.* 56-3, which has special features of wilt resistance and fine staple which render it considerably superior to both the improved *Banilla* cotton and the *Local N. R.* varieties. This new selection has been fully tested on Government Farms in Khandesh and the examination of the data indicates that this cotton is eminently suitable for the Khandesh cotton growing districts and a great advance on either *Banilla* or the local cotton, especially in respect of wilt resistance and spinning performance. In yield, the new selection, which has been designated by the Agricultural Department as *Jarila*, is superior to *Banilla*. Accordingly proposals for this scheme, which has replaced the Khandesh (*Banilla*) scheme, entailing an expenditure of Rs. 2,57,682 spread over a period of five years including Rs. 32,500 on account of receipts estimated for the full period of the scheme, were considered by the Committee at its meeting held in March 1937. But owing to certain administrative difficulties and pending the availability of field-trial results on a more extensive scale and more data in regard to the spinning and commercial qualities of bulk samples of this cotton, the scheme was only sanctioned in the first instance for a period of ten months at a net cost of Rs. 13,075. The scheme came into operation on the 1st May 1937 and no results are yet available.

82. *Deccan Canals (Banilla) Scheme.*—This scheme for the supply of pure *Banilla* cotton seed for the Deccan Canals area was sanctioned in January 1934 and started work in April 1934 on the Government Farm at Kopergaon. Unlike other seed schemes, this scheme is expected to be self-supporting. Of the sixty acres set apart for the scheme at the Kopergaon Government Farm 31.5 acres were under cotton and the remaining 28.5 acres under groundnut during the year. Cotton suffered from adverse weather conditions and damage by pests and diseases, and gave a total yield of 21,359 lbs. of *kapas* or 678 lbs. per acre, against a total yield of 22,378 lbs. of *kapas* or 733 lbs. per acre, last year. All the *kapas* was ginned at the Farm and 8,875 lbs. of good seed were sent for distribution in the canal area and dry tract. Groundnut gave an average yield of 1,285 lbs. per acre against 1,630 lbs. last year. At its meeting in August last, the Committee sanctioned the expansion of the area under the scheme by 60 acres for one year, i.e., during 1938-39, on the same lines as before to cope up with the growing demand for the seed.

83. *B.D.* 8 *Scheme.*—This scheme for the distribution and extension of *B. D.* 8 cotton seed was sanctioned in August 1935 for a period of 3 years and commenced work in December 1935. During the year, an area of 20,012 acres was under pure *B. D.* 8 cotton in the Broach district which gave a total yield of 4,500 bales. Of this, 1,522 bales were sold through sale societies at a premium ranging between Rs. 46 and Rs. 58 on *Broach*. The remaining 2,978 bales were purchased from cultivators by ginneries at a premium of Rs. 37 to Rs. 52 on *Broach*.

Sind.

84. *The Sind Scheme* commenced in April 1931 and on the expiry of its first sanctioned period of 3 years it was extended for a further period of 5 years. The work of the past six years has definitely proved that the Right Bank area of the Indus is as suitable as any other part of Sind for growing long staple cotton and it is now proposed to pay special attention to seed distribution, the introduction of better methods of cultivation, and the extension of cotton in lands under the Barrage area. Cotton cultivation was unknown on this side of the Indus before the commencement of this scheme, but as a result of intensive propaganda carried on by means of field demonstrations, shows, public meetings, etc., the area under cotton has now gone up to 42,000 acres against 17,000 acres in the previous year and 25 acres in 1931-32.

The work on the Right Bank is mainly concerned with the introduction of cotton cultivation, while on the Left Bank attention is largely devoted to seed distribution and extension of improved varieties of cotton and the introduction of better methods of cultivation. During the year under report, the area under cotton in Sind went up to 976,832 acres (including 63,229 acres in Khairpur State) from 790,858 acres last year, and of this area 568,588 acres were occupied by American varieties and 408,244 by *Desi* varieties. The Agricultural Department distributed 14,060 *maunds* of 4 *F*-98 and Sind *Sudhar* seeds on the Right Bank and 21,586 *maunds* of Sind *Sudhar*, 812 *maunds* of Egyptian and 3,685 maunds of Sind *N. R.* on the Left Bank.

Central Provinces and Berar.

85. *Verum Seed Distribution and Marketing Scheme.*—In November 1929, the Committee sanctioned, for a period of one year in the first instance, the Central Provinces *Verum* seed distribution and extension scheme. It started work in September 1930 and was extended annually up to the end of July 1934, when it was combined with the newly sanctioned scheme for the extension of long staple cottons in the Central Provinces. The combined scheme which is sanctioned for five years is known as the scheme for the extension of long staple cottons and marketing of *Verum* cotton in the Central Provinces and Berar.

During the year, the Agricultural Department distributed 5,594 *khandies* of pure seed of long staple varieties sufficient to cover an area of about 117,849 acres as against 4,142½ *khandies* of pure seed distributed over an area of about 103,537 acres last year. 5,853 *khandies* of pure seed have been stocked for distribution during 1937-38 season. 8,757½ bales of pure cotton were disposed of at an average premium of Rs. 1-3 on *Broach* and of Rs. 19 on *Oomras* against Rs. 42-9 on *Broach* and Rs. 60 on *Oomras* last year. The premium obtained during the year was the lowest on record since the marketing of *Verum* cotton was undertaken. It is estimated that an area of 113,371 acres will be covered by *Verum* cotton during 1937-38. There is a slight fall in the area due to low premium obtained during 1936-37 season and unfavourable weather conditions.

United Provinces.

86. *C.* 402 *Scheme.*—This scheme was sanctioned in January 1934 for a period of five years for the distribution of *C.* 402 seed in the Hardoi, Lucknow and Sitapur districts of the United Provinces and commenced work in May 1935. Though superior to the local cotton, *C.* 402 requires more careful cultivation and it was therefore decided early in 1935 to restrict its distribution to Madhoganj and Bilgram *tehsils* only, where it gives satisfactory results without extra labour and to extend, in the remaining areas covered by the scheme, another variety, *C.* 520, which is better suited for them than *C.* 402. During the year, the total area under *C.* 402 and *C.* 520 was 2,618 and 1,000 acres, respectively, but only 1,362 and 258 acres, respectively, were picked owing to unfavourable weather conditions. The average yield of *C.* 402 was from 1 to 3 *maunds* per acre and that of *C.* 520, 1 to 4 *maunds* per acre under cultivators' conditions, against 4 to 6 *maunds* and 7 to 10 *maunds*, respectively, in the previous year.

Hyderabad State.

87. *The Hyderabad Scheme* was sanctioned in November 1929 and started work in March 1930. It was extended for three years in January 1933 and subsequently for a further period of six months up to the 31st August 1936. In August 1936, the Committee sanctioned a further extension for four and half years subject to the condition that at least fifty per cent. of the cost should be met by the State. During the first two years of the scheme, *Dharwar No.* 1 and *Gadag No.* 1 seeds were distributed but as a result of the experiments conducted by the Hyderabad Agricultural Department, and, in view of the fact that the Bombay Agricultural Department had found the *Jayawant* variety more suitable for the neighbouring areas of that province, the distribution of *Dharwar No.* 1 seed was discontinued in 1931-32 in favour of *Jayawant.* As against the practice in previous years of obtaining seed from the Hubli and Gadag Co-operative Sale Societies, the seed required for the year under report was secured locally from selected growers. During the year the rain in the months of July to September, on which the sowing of cotton depends, was too little and the sowings were, therefore, delayed by about a month. Consequently the total quantity of *Jayawant* and *Gadag No.* 1 seed distributed during the year amounted to 374,633 lbs. sown over an area of 13,871 acres, against 553,880 lbs. of seed sown over an area of 41,256 acres, last year.

The Department of Agriculture organised during the year a seed multiplication area of 3,000 acres which is expected to yield 285,500 lbs. pure seed for distribution during 1937-38 season.

Baroda State.

88. *The Baroda (Navsari Seed Storage) Scheme* was sanctioned in February 1933 for a period of five years for the rapid spread of 1027 *A.L.F.*

in the Baroda territory, and started operations in April 1934. The total quantity of seed distributed during the year amounted to 314,432 lbs. of which 28,020 lbs. of the best quality seed were issued to 'A' class growers for an area of 2,506 acres and 76,628 lbs. of dependable quality seed to 'B' class growers for 3,544 acres. The lack of farm-grown seed for supply to 'A' class growers has all along been felt to be a weak spot in the Baroda seed organisation and the State have now taken steps to remedy this defect by opening a seed farm of about 70 acres. This area will form the nucleus from which 'A' class growers will receive their seed. 447,516 lbs. of seed of dependable quality for sowing in 1937 season have been obtained and it is expected that the whole of this quantity will be disposed of.

RESEARCH STUDENTS.

89. Ever since its establishment, one of the chief concerns of the Committee has been the training of research workers in the several sciences pertaining to cotton. Distinguished graduates from Indian Universities are selected and placed for training under experienced research workers on the Committee's schemes, at the Institute of Plant Industry, Indore, at the Committee's Technological Laboratory or under Agricultural Officers in India or are sent abroad to recognised institutions. Scholarships are usually awarded for periods not exceeding two years but in deserving cases extensions are granted.

Scholarships are awarded under two categories, viz., Training Grants and General Scholarships. Training Grants are intended for Government servants who are recommended by their Provincial Governments or States and for employees of the Committee who are considered suitable. General Scholarships are awarded to University Graduates not already in service. Applications for these scholarships are invited by advertisement in all leading Indian newspapers and the awards are made by the Research Students Selection Sub-Committee.

Fifty-four scholarships and eight training grants have so far been awarded by the Committee, out of which one scholarship and five training grants were for foreign study. During the year under report six research students were under training, four in India and two abroad.

The expenditure on Research Studentships up to 31st August 1937 amounted to Rs. 2,61,172.

D. N. MAHTA,
Secretary.

APPENDIX I.

MEMBERS OF THE COMMITTEE.

PRESIDENT—

Sir Bryce Burt, C.I.E., M.B.E., I.A.S., Offg. Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*.

(*a*) The Expert Adviser to the Imperial Council of Agricultural Research in Agricultural matters, *ex-officio*.

(2) REPRESENTATIVES OF AGRICULTURAL DEPARTMENTS—

Madras	M.R.Ry. Rao Bahadur D. Ananda Rao Garu, Director of Agriculture.
Bombay	The Director of Agriculture.
United Provinces	The Director of Agriculture.
Punjab	The Director of Agriculture.
Central Provinces	Mr. R. H. Hill, I.A.S., Offg. Director of Agriculture.

(3) THE DIRECTOR-GENERAL OF COMMERCIAL INTELLIGENCE AND STATISTICS, *ex-officio*.

(4) REPRESENTATIVES OF CHAMBERS OF COMMERCE AND ASSOCIATIONS—

The East India Cotton Association ..	Sir Purshotamdas Thakurdas, C.I.E., M.B.E. (*Vice-President*).
The Bombay Millowners' Association ..	Mr. S. D. Saklatvala, M.L.A.
The Bombay Chamber of Commerce ..	Mr. S. B. Samoilys.
The Indian Merchants' Chamber	Mr. Chandulal P. Parikh, M.L.A.
The Karachi Chamber of Commerce ..	Mr. G. C. R. Coleridge.
The Ahmedabad Millowners' Association .	Mr. Kasturbhai Lalbhai.
The Tuticorin Chamber of Commerce ..	Mr. J. Vonesch.
The Upper India Chamber of Commerce. .	Mr. J. Tinker.
The Empire Cotton Growing Corporation .	Mr. W. Roberts, C.I.E.

(5) AND (6) COMMERCIAL REPRESENTATIVES NOMINATED BY LOCAL GOVERNMENTS—

Central Provinces	Mr. P. V. Deshmukh. Mr. D. K. Kane.
Madras	Mr. J. Nuttall.
Punjab	Mr. Balak Ram.
Bengal	Mr. Akhil Bandhu Guha.

(7) CO-OPERATIVE BANKING REPRESENTATIVE—

Sir Chunilal V. Mehta, K.C.S.I.

(8) REPRESENTATIVES OF COTTON-GROWING INDUSTRY—

Madras	M.R.Ry. V. C. Palaniswami Gounder, Avl. M.R.Ry. Rao Bahadur B. P. Sesha Reddi Garu.
Bombay	Sardar Rao Bahadur Bhimbhai Ranchodji Naik. Rao Bahadur C. S. Shirahatti.
United Provinces	Khan Bahadur Shah Nazar Husain. Rai Bahadur Lala Anand Sarup.
Punjab	Sardar Sahib Gurbachan Singh, M.L.A. Mian Nurullah.
Central Provinces and Berar ..	Rao Bahadur Sir Madhaorao Deshpande, K.B.E. Mr. M. P. Kolhe.

(9) AND (10) REPRESENTATIVES OF INDIAN STATES—

Hyderabad State	Mr. Nizam-ud Din Hyder, Director of Agriculture.
Baroda State	Mr. R. G. Allan, C.I.E., Commissioner of Agriculture.
Gwalior State	Mr. G. K. Lele, Deputy Director of Agriculture, Malwa Division.
Rajputana and Central India States	Mr. T. R. Low, I.A.S.

(11) ADDITIONAL MEMBERS NOMINATED BY THE GOVERNOR-GENERAL-IN-COUNCIL—

1. Mr. D. N. Mahta*, Economic Botanist for cotton, Central Provinces.
2. Rao Bahadur S. S. Salimath, Deputy Director of Agriculture, Southern Division, Dharwar.
3. Dr. V. K. Badami, Ph.D., Deputy Director, Department of Agriculture in Mysore State, Bangalore.
4. M.R.Ry. V. Ramanatha Ayyar Avl., Cotton Specialist, Coimbatore.
5. Musahib-i-Khas Bahadur S. V. Kanungo, Finance Minister, Holkar State, Representative of the Holkar State.
6. Rao Saheb K. I. Thadani, Director of Agriculture, Sind, Karachi.
7. Seth Isserdas Varindmal, M.L.A., Representative of the Karachi Indian Merchants' Association.
8. The Economic Botanist (Cotton) to the Government of the United Provinces, Cawnpore.
9. Mr. Sayed Miran Muhammad Shah, M.A.C., 50, Cantonment, Hyderabad, Sind.
10. Khan Saheb Farrukhbeg Sadikalibeg Mirza, Nawabshah, Sind.
11. Lala Shri Ram, Representative of the Cotton Millowners of Delhi.
12. Mr. Chellaram Shewaram, Representative of the Karachi Cotton Association, Ltd.
13. Dewan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

* Since appointed Secretary of the Committee.

APPENDIX II.

CONSTITUTION OF SUB-COMMITTEES.

STANDING FINANCE SUB-COMMITTEE.

Sir Bryce Burt (*ex-officio*).
Sir Purshotamdas Thakurdas (*Chairman*).
Mr. S. D. Saklatvala.
Mr. Kasturbhai Lalbhai.
Mr. G. C. R. Coleridge.
Mr. J. Vonesch.
Rao Bahadur Sir Madhaorao Deshpande.
Sir Chunilal V. Mehta.
Mr. S. B. Samoilys.

LOCAL SUB-COMMITTEE.

Sir Bryce Burt.
Sir Purshotamdas Thakurdas.
Mr. S. D. Saklatvala.
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Mr. W. J. Jenkins.
Rao Bahadur Sir Madhaorao Deshpande.
Mr. J. Vonesch.
Mr. Chandulal P. Parikh.
Mr. G. C. R. Coleridge.
Sir Chunilal V. Mehta.
Mr. S. B. Samoilys.
Mr. Kasturbhai Lalbhai.

COTTON GINNING AND PRESSING FACTORIES SUB-COMMITTEE.

Sir Purshotamdas Thakurdas.
Mr. S. D. Saklatvala.
Mr. W. J. Jenkins.
Mr. Kasturbhai Lalbhai.
Mr. G. C. R. Coleridge.
Mr. J. Tinker.
Mr. J. Nuttall.
Mr. W. Roberts.
Vacant (three seats).

The Co-operative Banking Representative—Sir Chunilal V. Mehta, and Mr. Chellaram Shewaram—(*Co-opted Member*).

AGRICULTURAL RESEARCH SUB-COMMITTEE.

I. *The President.*—Sir Bryce Burt.

II. *The Vice-President.*—(*ex-officio*).

III. *The Co-operative Banking Representative.*—Sir Chunilal V. Mehta.

IV. *Cotton Growers' Representatives.*—Mr. W. Roberts, Mian Nurullah; Rao Bahadur Sir Madhaorao Deshpande.

V. *Cotton Trade Representatives.*—Mr. Kasturbhai Lalbhai; Mr. D. K. Kane; Mr. Chandulal P. Parikh.

VI. *Agricultural Officers.*—The Agricultural Expert to the Imperial Council of Agricultural Research (*ex-officio*); The Director, Institute of Plant Industry, Indore (*ex-officio*); Mr. H. R. Stewart; Mr. V. Ramanatha Ayyar; Mr. R. G. Allan; Mr. W. J. Jenkins; Rao Bahadur D. Ananda Rao Garu; Mr. D. N. Mahta; Mr. P. B. Richards; Rao Saheb K. I. Thadani; Mr. Nizam-ud Din Hyder; Mr. G. K. Lele; Dr. V. K. Badami; Vacant (two seats).

VII. *Additional Members.*—Dewan Bahadur Sir T. Vijayaraghavacharya; Mr. Chellaram Shewaram; Mr. Mohammad Afzal; Rai Saheb Kalidas Sawhney; Mr. K. Ramiah; and

VIII. *The Secretary.*

TECHNOLOGICAL RESEARCH SUB-COMMITTEE.

The President (*ex-officio*).
The Vice-President (*ex-officio*).
The Agricultural Expert to the Imperial Council of Agricultural Research (*ex-officio*).
Mr. H. R. Stewart.
Mr. Chandulal P. Parikh.
Mr. Kasturbhai Lalbhai.
Rao Bahadur D. Ananda Rao Garu.
Dewan Bahadur Sir T. Vijayaraghavacharya.
Mr. S. D. Saklatvala.
Mr. W. J. Jenkins.
Mr. J. Tinker.
Mr. S. B. Samoilys.
Mr. P. V. Deshmukh.
Mr. J. Vonesch.
Lala Shri Ram.
Dr. Nazir Ahmad.

Mr. A. D. Walwyn, Mr. F. Stones (Representing the Bombay Millowners' Association).

Seth Sakarlal Balabhai, Seth Ratilal Nathalal (Representing the Ahmedabad Millowners' Association).

Mr. R. G. Saraiya, Mr. Jamnadas Ramdas (Representing the East India Cotton Association, Ltd.).

Mr. T. B. Dalal (Representing the Karachi Cotton Association, Ltd.).

RESEARCH STUDENTS SELECTION SUB-COMMITTEE.

The President.
The Vice-President.
Dewan Bahadur Sir T. Vijayaraghavacharya.
Dr. W. Burns.
Mr. H. R. Stewart.
Mr. T. R. Low.
Mr. R. G. Allan.
Mr. P. B. Richards.
Rao Bahadur D. Ananda Rao Garu.
Mr. W. J. Jenkins.
Rao Saheb K. I. Thadani.
Mr. G. K. Lele.
Mr. Kasturbhai Lalbhai.
Mr. Nizam-ud Din Hyder.
Dr. V. K. Badami.
Dr. Nazir Ahmad.
Vacant (two seats).

COTTON FORECAST IMPROVEMENT SUB-COMMITTEE.

The President (*ex-officio*).

The Agricultural Expert to the Imperial Council of Agricultural Research (*ex-officio*).

The Director-General of Commercial Intelligence and Statistics.

The Director of Agriculture, Bombay Presidency.
Do. do. Punjab.
Do. do. Madras.
Do. do. United Provinces.
Do. do. Central Provinces.
Do. do. Sind.
Do. do. H. E. H. the Nizam's Government.

The Director of Land Records, Central Provinces and Berar.
The Commissioner of Agriculture, Baroda.
The Director of Statistics, H. E. H. the Nizam's Government.
The Deputy Director of Statistics.
The Statistical Officer, Board of Revenue, Madras.
Mr. J. Vonesch.

WIDER MARKETS SUB-COMMITTEE.

The President.
The Vice-President.
Dewan Bahadur Sir T. Vijayaraghavacharya.
Mr. H. R. Stewart.
Mr. P. B. Richards.
Dr. W. Burns.
Mr. S. D. Saklatvala.
Mr. J. Vonesch.
Mr. Chandulal P. Parikh.
Mr. P. V. Deshmukh.
Mr. W. Roberts.
Rao Saheb K. I. Thadani.
Mr. R. H. Hill.
Mr. Balak Ram.
Sardar Rao Bahadur Bhimbhai Ranchodji Naik.
Rao Bahadur D. Ananda Rao Garu.
Mr. Nizam-ud Din Hyder.
Mr. W. J. Jenkins.
Mr. Chellaram Shewaram.
Mr. Kasturbhai Lalbhai.
Dr. Nazir Ahmad.
Mr. R. G. Saraiya—Additional member
Vacant (one seat).

STANDARDS SUB-COMMITTEE.

Mr. S. H. Gidwani (Representing the Imperial Council of Agricultural Research).

Mr. Haridas Madhavdas, Mr. Varjivandas Motilal (Representing the East India Cotton Association, Ltd.).

Mr. D. McCallum, Mr. Nechaldas Chhangomal (Representing the Karachi Cotton Association, Ltd.).

Rao Bahadur Sir Madhaorao Deshpande, Mr. M. P. Kolhe (Representatives of cotton growers of Berars Tract).

Mr. Himatlal Jagjiwandas Vadodaria, Mr. Vadilal Chunilal Doshi (Representatives of cotton growers of Mathia Tract).

Mr. Akhubava Takhatsinghji Chudasama, Mr. Mulchand Vardhman Shah (Representatives of cotton growers of Dholleras Tract).

Mr. Haribhai Jhaverbhai Amin, Mr. Ardeshir Jamshedji Kapadia (Representatives of cotton growers of Broach Tract).

Rao Bahadur S. J. Deshmukh, Rao Bahadur B. L. Patil (Representatives of cotton growers of Kumpta Tract).

APPENDIX III.

POLICY OF THE COMMITTEE REGARDING APPORTIONMENT OF COST OF SCHEMES BETWEEN THE COMMITTEE, PROVINCIAL GOVERNMENTS AND INDIAN STATES—RECOMMENDATIONS OF THE SPECIAL SUB-COMMITTEE AS FINALLY APPROVED BY THE COMMITTEE.

Expenditure on seed schemes should be divided into (1) cost of staff and (2) incidental charges on the distribution of seed of approved varieties less receipts, if any. The Committee should pay *either* the cost of staff or the incidental expenditure but not both. Seed schemes should be sanctioned for periods not exceeding five years in the first instance and they may be extended subsequently for a further period of five years on the condition that (*a*) the Committee's share of the expenditure in the second period should be to the extent of 75 per cent. either on the pay of the staff or incidental expenditure and (*b*) that the Local Government concerned contributes not less than the sum spent during the original period of the scheme. It is not necessary that the grant for the renewal period should be less than for the first sanctioned period, but the Committee's contribution should not exceed 75 per cent. The maintenance of a nucleus of each approved variety for seed propagation should be undertaken by the Cotton Breeder as part of the breeding scheme and should be financed by the Indian Central Cotton Committee and an area of one acre for the purpose is considered to be the irreducible minimum for each variety. The Committee should meet the cost of the maintenance of a nucleus of seed from all varieties of cotton, the spread of which had been approved by it. The Sub-Committee agreed that in Seed Distribution Schemes when a change in the variety under distribution was made and approved by the Indian Central Cotton Committee further continuance of the scheme should be treated as a new seed distribution scheme and not as a renewal of the original scheme. Research schemes should be financed up to a period of ten years in full, subject to review at the end of 3rd, 5th and 8th year as at present. To justify further financial help after ten years special technical or scientific reasons are necessary. This is all the more necessary if the Committee's share is to exceed 50 per cent. of the total expenditure to which it should normally be limited. It was agreed that any scheme affected in the immediate future should be fully financed by the Committee for one full year more to enable the Director of Agriculture concerned to obtain the necessary finance from his Government for the subsequent years.

APPENDIX IV.

LIST OF RESOLUTIONS.

"The Indian Central Cotton Committee urges the East India Cotton Association, Ltd., to take steps to broaden the Broach Hedge Contract in such a way as to make it a safer hedge for more good quality Indian stapled cotton, and thereby prevent cotton-growers being subjected to unavoidable losses by manipulations in the Bombay market."

"That the Indian Central Cotton Committee places on record its appreciation of the action of the Holkar Durbar in forming a Cotton Committee and trusts that it will be found to be of much benefit in the solution of local problems. The Indian Central Cotton Committee will be pleased to render any assistance that may be required."

"That the Indian Central Cotton Committee places on record its satisfaction that the United Provinces Cotton Pest Control Act has been passed by the United Provinces Legislative Council and trusts that no time will be lost in giving effect to the rules under it. It is confident that this piece of legislation will go a long way towards improving the quality and yield of cotton in the tracts to which it will be applied and that both the cotton growers and the cotton trade in the United Provinces will benefit."

"That the letter of the East India Cotton Association be forwarded to the Government of Bombay with the remark that this Committee adheres to its previous opinions and considers that the admixture of 2 per cent. seed will be tantamount to nullify the provisions of the Act. Regarding moisture also the Committee does not agree with the opinion of the East India Cotton Association. The Committee, however, agrees with the view of the Association as regards the license fee which should be not more than Rs. 100."

"That the suggestion regarding an overseas organisation be approved in principle and a proper scheme be worked out and put up before the next meeting of the Wider Markets Sub-Committee. The suggestion might be examined further by the Standing Finance Sub-Committee and with their approval the scheme might be put before the full Committee."

"The Indian Central Cotton Committee notes with pleasure that the Kutch Darbar has agreed to co-operate in prohibiting the import into the Kutch State of all foreign cotton seed and *kapas*. The Committee trusts that those maritime States who have not yet signified their agreement with the policy will also fall in line at no distant date."

"The Indian Central Cotton Committee records its thanks to the Jhalawar Darbar for the very thorough enquiry undertaken by them to ascertain the extent to which outside cotton is imported into the State and trusts that no time will be lost in adopting legislative measures to prevent such imports, if and when found necessary."

"The Indian Central Cotton Committee places on record its appreciation of the action of the Government of the Central Provinces in passing the Central Provinces Cotton Control Act which has for its object the eradication of Garrow Hill cotton. The Committee has no doubt that the suppression of this cotton is in the best interests of the growers of better quality cotton in the provinces and trusts that early steps will be taken to frame the required rules under the Act and apply them where necessary."

"The Indian Central Cotton Committee welcomes the action of the Bhopal Darbar in taking steps to introduce legislation for the cultivation of superior cotton in the State."

"This Conference agrees that the breeding of strains immune to wilt under optimum conditions is the ideal to aim at. For agricultural distribution, resistance of the order of 95 per cent. under heavily infected field conditions is satisfactory, provided that the strain has been tested and shown to be practically homozygous for that degree of resistance to wilt.

The Conference recommends that

(1) tests for homozygosity should be applied before a resistant strain is released for distribution,

(2) the Pathologist should also conduct tests for homozygosity and need only select in material shown to be heterozygous,

(3) the conditions under which field tests are being carried out should be described and standardised as far as is practicable."

APPENDIX V.

CENTRAL PROVINCES ACT No. XX OF 1937.—THE CENTRAL PROVINCES COTTON CONTROL ACT, 1937.

[Published in the *Central Provinces Gazette*, dated the 12th February, 1937.]

An Act to provide for the prohibition of the cultivation of Garrowhill cotton (Gossypium cernuum) in the Central Provinces.

Preamble.—Whereas it is expedient, in the best interests of the growers of cotton in the Central Provinces, the cotton trade and the general economic prosperity of the Province : to maintain the quality and reputation of the cotton grown in the Province and, for that purpose, to prohibit the cultivation of Garrowhill cotton ;

And whereas the previous sanction of the Governor General required under subsection (3) of section 80-A of the Government of India Act has been obtained to the passing of this Act ;

It is hereby enacted as follows :—

1. *Short title, extent and commencement.*—(1) This Act may be called the Central Provinces Cotton Control Act, 1937.

(2) It extends to the whole of the Central Provinces.

(3) It shall come into force on such date as the Local Government may, by notification, appoint in this behalf.

2. *Definitions.*—In this Act, unless there is anything repugnant in the subject or context :—

(*a*) " cotton " includes cotton plant, ginned as well as unginned cotton, cotton waste and cotton seed ;

(*b*) " notified area " means the local area specified in the notification issued under section 3 ; and

(*c*) " Garrowhill cotton" means the kind of cotton known as *Gossypium cernuum.*

3. *Prohibition of cultivation and mixing of Garrowhill cotton.*—The Local Government may, by notification prohibit in such local area and for such period as may be specified in the notification the cultivation of Garrowhill cotton as a pure crop or in a mixture, or mixing of such cotton with any other kind of cotton.

4. *Penalty for cultivating or mixing Garrowhill cotton.*—Whoever intending to, or knowing it likely that he will, contravene any notification issued under section 3 cultivates Garrowhill cotton as a pure crop or in a mixture, or mixes such cotton with any other kind of cotton shall, on conviction by a Magistrate, be punishable with fine which may extend to twenty rupees and, on any subsequent conviction, with fine which may extend to fifty rupees.

5. *Power of entry, inspection and seizure.*—(1). Any officer authorized in this behalf by the Local Government may, after giving such notice as may be prescribed by rules made by the Local Government to the owner, occupier or person in charge of any land, building, vessel or place within the limits of a notified area and between the hours of sunrise and sunset,—

(*a*) enter upon or into any such land in which he knows or suspects that Garrowhill cotton is being cultivated in contravention of a notification issued under section 3 and call upon the occupier thereof by notice in writing to uproot or cause to be uprooted such cotton within a time to be specified in such notice and seize the cotton so uprooted, and

(*b*) enter upon or into any such land, building, vessel or place in which he knows or suspects that Garrowhill cotton or any cotton mixed with Garrowhill cotton cultivated in contravention of a notification issued under section 3 is kept and seize such cotton.

(2) Every officer seizing any cotton under this section shall forthwith—

(*a*) make a report of such seizure to the Magistrate having jurisdiction to try the offence committed in respect of such cotton, together with particulars of such cotton, and furnish a copy of such particulars to the occupier of the land, building, vessel or place on and in which such seizure has been made ; and

(*b*) subject to such rules as the Local Government may make in this behalf, forward such cotton to the nearest officer authorized by the Local Government to receive it for examination and report to the Director of Agriculture, Central Provinces.

(3) The opinion of the authorized officer referred to in clause (*b*) of sub-section (2) contained in any document signed by such officer regarding the cotton sent to him for examination under that clause may be used as evidence as to the nature of such cotton in any inquiry, trial or proceeding under this Act.

6. *Effect of non-compliance with notice under section* 5 (1) (*a*).—If any occupier upon whom a notice has been served under clause (*a*) of sub-section (1) of section 5 does not comply with such notice, he shall be deemed to have committed an offence under section 4 and the officer referred to in sub-section (1) of section 5 may take action under sub-section (2) of that section at the cost of the occupier and such cost shall be recoverable as an arrear of land revenue.

7. *Duty of owner or occupier or person in charge to give facilities for inspection.*—(1) Every owner, occupier or person in charge of any land, building, vessel or place within the limits of a notified area shall give all reasonable facilities to any officer authorized under sub-section (1) of section 5 to inspect such land, building, vessel or place.

(2) Whoever commits a breach of the provisions of sub-section (1) shall be punishable with fine which may extend to twenty rupees.

8. *Previous sanction and limitation for prosecutions.*—No prosecution for an offence made punishable by or under this Act shall be commenced without the previous sanction of the Director of Agriculture and no such prosecution shall be commenced after six months from the date of the commission of the offence.

9. *Magistrates who can try offences.*—No offence made punishable by or under this Act shall be tried by any Court inferior to that of a Magistrate of the Second Class.

10. *Saving of acts done under this Act.*—No suit, prosecution or other legal proceedings shall lie against any person for anything in good faith done or intended to be done in pursuance or execution of this Act.

11. *Power to make rules.*—(1)—The Local Government may, after previous publication, make rules consistent with this Act generally for carrying out all or any of the purposes thereof.

(2) In making any rule, the Local Government may provide that a breach thereof shall be punishable with fine which may extend to twenty rupees.

APPENDIX VI.

RULES UNDER THE COTTON GINNING AND PRESSING FACTORIES (CENTRAL PROVINCES AMENDMENT) ACT.

GOVERNMENT OF THE C. P. AND BERAR,

COMMERCE AND INDUSTRY DEPARTMENT.

NOTIFICATION.

NAGPUR, *the 25th October* 1937.

No. 2569-2489-*VII.*—In exercise of the powers conferred by section 13 of the Cotton Ginning and Pressing Factories Act, 1925 (XII of 1925), as applied to Berar, as amended, the Provincial Government is pleased to make the following amendments to the Berar Cotton Ginning and Pressing Factories (Local Government's) Rules, 1925 :—

Amendments.

1. After rule 6 the following rules shall be *inserted* namely :—

"PERIOD CONSTITUTING A SEASON.

Section 13 (*ab*).

6A. For the purposes of sections 2(*i*) and 5 the season shall commence on the 1st day of September in each year and terminate on the 30th day of June of the year following.

AUTHORITY, THE FORM, THE CONDITIONS AND THE FEE FOR GRANTING A LICENCE.

Section 13 (*ac*).

6B. (1) The authority for granting a licence under sub-section (1) of section 2A shall be the Director of Industries, Central Provinces and Berar.

(2) The licence shall be in Form F.

(3) An application for the issue of a licence shall be in writing and shall be sent to the licensing authority by registered post so as to reach him not less than fifteen days before the date on which the applicant wishes to commence working his factory. The applicant will be at liberty to commence working his factory if the licence is not received within 15 days, unless otherwise directed by the licensing authority.

(4) The fee for a licence shall be ten rupees per annum. It shall be credited into a Government treasury and the chalan in token of its payment shall accompany the application.

(5) In the event of a licence being lost, a duplicate shall be issued by the Director of Industries, Central Provinces and Berar, on payment of a fee of one rupee.

THE PERMISSIBLE PROPORTION OF SEED IN GINNED COTTON.

Section 13 (*ae*).

6C. The proportion of seed, both ginned and unginned, shall not exceed 1 per cent. of the weight of the cotton.

CERTIFICATE REGARDING QUANTITY OF MOISTURE, ETC.

Section 13 (*af*).

6D. The person authorised to give the certificate referred to in the explanation below section 3A shall be the Agricultural Chemist to Government, Central Provinces and Berar.

THE EXAMINATION OF BALES.

Section 13 (*ag*).

6E. The person competent to examine cotton or the contents of a package or bale and to grant a certificate for the purposes of section 3B shall be the Agricultural Chemist to Government, Central Provinces and Berar.

THE PROCEDURE FOR THE EXAMINATION OF BALES AND THE FEE FOR SUCH EXAMINATION.

Section 13 (*ah*).

6F. (1) Every complaint of contravention of the provisions of section 3A shall be addressed in writing to the Chief Inspector of Boilers and Factories, shall state the grounds for the complaint and shall specify the factory and the cotton, package or bale or bales in respect of which such contravention is alleged to have taken place.

(2) The fee payable by the complainant shall be fifty rupees which shall be refunded if the complaint is found to be true or justified.

(3) Every such complaint shall be accompanied by a chalan showing that the prescribed fee has been credited into a Government treasury.

(4) If the complainant is not in possession of the cotton, package or bale in respect of which the contravention of the provisions of section 3A is alleged to have taken place the complaint shall be sent by registered post to the Chief Inspector of Boilers and Factories. On receipt of a complaint under rule 6F (1) the Chief Inspector of Boilers and Factories shall make or cause to be made such investigation as he considers to be necessary, and if he is satisfied that there are *prima facie* grounds for proceeding with the complaint shall arrange to have the subject matter of the alleged offence seized and sealed in the manner prescribed in rule 6G, and shall forward it, together with a copy of the complaint and other relevant particulars to the person authorized to examine the cotton, package or bale.

(5) If the complainant is in possession of the cotton, package or bale in respect of which the contravention of the provisions of section 3A is alleged to have taken place, the complaint shall be presented together with the cotton, package or bale to the Tahsildar or Naib-Tahsildar at the nearest tahsil. The officer to whom the complaint has been presented shall examine the complainant and forward the complaint together with the record of the examination to the Chief Inspector of Boilers and Factories. He shall, at the same time, retain a quantity of the cotton itself or the cotton in the package or bale presented and dispose of the things so retained in the manner prescribed in rule 6G.

SEALING OF THINGS SEIZED.

Section 13 (*ai*).

6G. (1) The authorized officer shall enclose the things seized or retained in the special bag provided for the purpose and seal the bag with the special lead seals provided for the purpose in the presence of the owner or the person in charge of the factory or where these are not present in the presence of two witnesses.

(2) Where the offence that appears to have been committed is the watering of cotton, the cotton or a representative sample of it seized shall be divided into two halves, and each half shall be placed in the special bag provided for the purpose by the Chief Inspector of Boilers and Factories. The bags will be so filled that when full and with the special seal attached, but not fastened, they will weigh each exactly 5 lbs. avoirdupois on the special balances provided for the purpose by the Chief Inspector of Boilers and Factories. The seals shall be fastened after the weighment.

(3) The bags so sealed shall be labelled with a detachable label showing the name of the factory and such particulars and distinguishing marks as may be necessary for their identification. The bags shall be forwarded to the Chief Inspector of Boilers and Factories, who shall, if the alleged offence is not the watering of the cotton, send them to the Agricultural Chemist to Government for examination. If the alleged offence is the watering of the cotton, one of the sealed bags shall be sent to the Agricultural Chemist for examination; and the remaining bags shall be retained by the Chief Inspector till the final disposal of the case.

2. The Form B appended hereto shall be substituted for the Form B prescribed in rule 4.

3. Rule 16 shall be omitted and rules 17 and 18 shall be renumbered as rules 16 and 17.

FORM B.

Press Register.

Name of factory.....Name of owner.....Name of Lessee (if any).....Press mark.....

Date. Year. Month. Day.	Serial Numbers of bales.	Name of person for whom pressed.	(In these columns may be entered the weights of the bales, average weights, etc., to facilitate the preparation of the returns under section 5.)			Particulars of cotton ginning factory where bale was ginned as supplied by person in column 3.				Signature of owner or person in charge.
						Name of factory.	Name of owner.	Name of Lessee, if any.	Place where situated.	
1	2	3	4	5	6	7	8	9	10	11

FORM F.

Licence (see rule 6-B (2).

Name of the factory and locality.....District.....

Serial No.	Purpose for which licence is granted.	Authority entitled to grant licence.	Period for which licence is valid.	Fee paid.

By order of the Governor, Central Provinces and Berar,
G. S. BHALJA,
Secretary to Government, C. P. and Berar, Commerce and Industry Department.

APPENDIX VII.

PROGRESS IN THE INTRODUCTION OF IMPROVED VARIETIES OF COTTON.

BOMBAY.—*Broach Tract.*—During the year, the Department controlled 25,583 acres for seed multiplication including 1,589 acres grown with Farm pedigree seed. It was considered desirable to include Co-operative Societies in our group system so that the difficulty of procuring sufficient quantity of seed may not be felt. Accordingly three Societies were included in our seed group and thus the controlled area was increased.

The Department purchased in all 2,607,393 lbs. seed of which 23,698 lbs. were the produce of Surat Farm. The quantity of seed supplied from 26 depôts in the district amounted to 1,209,033 lbs. including 79,616 lbs. directly supplied by Hansot Co-operative Cotton Sale Society. A further stock of 1,477,946 lbs. was supplied to Rajpipla and other Indian States. Thus the total quantity of seed handled by the Department came to 2,687,009 lbs.

Since the passing of "Cotton Control Act" accompanied by intensive propaganda against *Ghoghari* and field to field survey work, *Ghoghari* has been practically eliminated. In Surat district, the inferior but higher ginning cotton, *Surat IA* continues to make progress as it fetches higher profits per acre to the cultivator under existing conditions. It is observed, however, that in the local market, *Surat IA* sells on par with Surat and Bardoli meaning thereby that buyers make no difference in these qualities. If, therefore, the good quality and reputation of Surat cotton are to be maintained, 1027 *A.L.F.* should command a better premium and steps should be taken by the improvement of marketing organization, etc., to achieve this object.

Deccan.—Ahmednagar District.—Owing to the scarcity of rains during the year 1936-37, 1/5 of the normal area in the dry tract was sown under cotton. 12,000 lbs. of seed of *Banilla* cotton were supplied to cultivators for nearly 800 acres. The total area under *Banilla* cotton was 650 acres. The crop, however, failed completely owing to want of moisture in the soil.

Sholapur District.—The year 1936-37 was a famine year. Rain was late and insufficient and there was no dry crop of cotton. The area under irrigation of *Banilla* cotton was 4,300 acres and 2,621 acres were under local cotton under well irrigation. The yield of *Banilla* cotton under irrigation varied from 800 to 1,000 lbs. of seed cotton per acre on an average. The *Banilla* strain is popular among cultivators and fetched a higher price of Rs. 5 to Rs. 8 per *khandi* of 500 lbs. of seed cotton.

Satara District.—The crop of cotton is grown in Eastern and Southern parts of the district and the total area under the crop was about 11,581 acres during 1936-37. The area of about 7,235 acres is covered in Eastern portion where short-stapled varieties like *N.R.* and *Banilla* are grown. Efforts are made to introduce *Banilla* cotton which yields better than local. The Department is arranging to replace the "local Jawari" *Kumpta* cotton with a superior type of *Jayawant* and also arranging open auction sales for securing higher price for *Jayawant.*

Deccan Canals.—The total area under cotton on Deccan Canals during the year 1936-37 was 16,573 acres as against 20,000 acres in 1935-36. The decrease is due to absence of rainfall at the time of sowing. Out of this total area under cotton, about 3,000 acres are under *Banilla* cotton as a result of the propaganda of introducing *Banilla* cotton in the Canal area which has been conducted by the Department of Agriculture since the last

7 or 8 years. During 1936-37 the Department distributed 33,450 lbs. of pure *Banilla* cotton seed.

Khandesh.—The improved variety of cotton evolved by the Bombay Agricultural Department and named *Banilla* cotton (cross between *Bani* and *Comilla* varieties) has now been under cultivation in Khandesh. It has been observed that it gives satisfactory yields and better quality of cotton in the black soils of Tapti belt than in the lighter description of soils. This cotton possesses finer staple and gives 40 per cent. of the local Khandesh. During the year 1936-37, the area under this cotton was about 66,000 acres representing about 5 per cent. of the total area under cotton in Khandesh. The outturn during the year is estimated at 16,500 bales or on an average 110 lbs. of lint per acre.

A seed distribution scheme of the Indian Central Cotton Committee is in operation in this district and under the Scheme an area of 10,000 acres was organised for the multiplication of pure seed. This scheme has been in operation for six years. It has been decided to close it down as a new cotton superior to *Banilla* in staple and highly resistant to wilt and suitable for Khandesh tract has been evolved. This new cotton is the selection *N. V.* 56-3 and is now named *Jarila.* A scheme for the multiplication of this cotton has been launched from May 1937. Even then distribution of *Banilla* seed will not be altogether given up until sufficient seed of *Jarila* cotton becomes available. 242,230 lbs. of pure seed of *Banilla* cotton have, therefore, been stocked for distribution. Besides, local merchants also have purchased and stocked appreciable quantities for distribution.

Kumpta-Dharwar Tract.—The work of introducing two improved varieties of cotton, viz., *Jayawant* and *Gadag No. I* was carried out on an extensive scale through the local agents and the Gadag Cotton Sale Society, with the aid of funds provided by the Indian Central Cotton Committee and the Government of Bombay. The reserved area of *Jayawant* cotton maintained for multiplying pure and pedigree seed of *Jayawant* cotton at different centres together was 25,006 acres against 25,377 acres last year and that of *Gadag No. I* at Gadag and Ron centres together was 22,614 acres as against 25,259 acres of the previous year. The quantity of seed received by the local agents and Cotton Sale Societies from these reserved areas was 2,603,534 lbs. of *Jayawant* and 1,070,865 lbs. of *Gadag No. I* sufficient to cover 260,353 and 107,086 acres, respectively, during 1937-38.

For distribution of general pedigree seed stocked by the local agents and Cotton Sale Societies, Seed-depôts were opened as usual in different selected centres and sub-centres. The general area grown with pure seed was 75,711 acres, excluding the area managed by the Cotton Sale Society, Hubli, for *Jayawant* cotton as against 118,423 acres last year, and 61,796 acres for *Gadag No. I* cotton as against 58,434 acres in the previous year. The estimated yield of *Jayawant* cotton was 10,071 bales as against 13,020 bales last year, and 8,441 bales of *Gadag No. I* as against 7,800 bales in the previous year.

Jayawant cotton obtained on an average the premium of Rs. 15 per *naga* of seed cotton (1,344 lbs.) in auction sales and *Gadag No. I* fetched Rs. 20 more per *naga.*

Sind.—During the decade prior to the opening of the Lloyd Barrage Canals, the annual area under cotton cultivation in Sind averaged slightly over 300,000 acres with an average outturn of 100,000 bales. With the advent of Barrage Canals on account of early and assured water supply and increased interest in cotton growing the area has increased to 982,007 acres (including Khairpur State) in the year 1936-37 with an approximate yield of 517,945 bales of cotton. The area under Sind American cottons was 561,206 acres in 1936-37 as against 384,415 acres in 1935-36. It is evident that the development of cotton cultivation in Sind is tending more and more towards the expansion of an area under superior types of American cottons for the cultivation of which irrigation and soil conditions in large tracts of the Barrage areas are eminently suitable.

Three main classes of cotton.—Three main classes of cotton have been found to be successful in Sind, viz, (*a*) Sind *Deshi*, (*b*) Sind American, (*c*) Imported Egyptian and Sea Island cottons.

Among each of these three main classes the Department of Agriculture, Sind, has, by botanical selection, evolved improved strains which, on account of better yield, high ginning outturn or superior quality, are suitable for extension in general cultivation in the different cotton growing tracts of the Barrage areas.

Sind Deshi Cotton.—This cotton has a special market of its own on account of its bright colour and rough feel, being suitable for mixing with wool. It is very hardy and resists variations in soil, climate and season. It is capable of giving high yields and can be sown late, i.e., in the month of June. The improved Sind *deshi* strain 27 *W. N.*, now known as *Sind N. R.* cotton, evolved by the Agricultural Department gives an early and abundant crop (about 16/20 per cent. greater outturn than ordinary Sind *deshi* and a 4/5 per cent. higher ginning outturn, i.e., 38/39 per cent.)

This improved *deshi* strain is now the standard *deshi* cotton in Sind. The total area under *deshi* cotton in 1936-37 was 420,801 acres (including Khairpur State) with an estimated outturn of 221,415 bales of cotton.

Sind American Cotton.—This cotton occupied in 1936 about 561,206 acres out of the total area of 982,007 acres under cotton. 4-*F* cotton was the most popular variety first grown in Sind. It has been partly replaced by other types, viz., 289-*F*, *N*: *T*. and *K*. *T*. cottons. The latter two types proved to be easily affected by red leaf disease and jassid attack and have been therefore given up for cultivation. The improved strains, noted below, established by the Agricultural Department, seed of which is being rapidly multiplied on a large scale, are definitely superior to the ordinary *Sind/American*.

These are :—

Sind American—4*F*-98.—It has a staple length of $\frac{7}{8}''$ to $\frac{15}{16}''$ and spins 34's. It has a ginning outturn of 33 per cent. and gives a high yield. This improved strain has been found to be most suitable type for cultivation in the new cotton growing tracts being established on the right bank of the Indus. In fact, the bulk of the crop in these areas is 4-*F*98, cotton.

Sind Sudhar (289*F*-1).—This improved strain has full 1" staple and spins 40's. It has a ginning outturn of 30 per cent. and in normal years is a very high yielder. This cotton is more resistant to red leaf disease, jassid attack and can withstand season variations of climate better than ordinary Sind-American. It is now being grown in general cultivation all over the Left Bank of the Indus where the present cotton area is mostly located. In fact, it is the 'bread and butter" of the cotton growers in Sind in the Barrage areas. The high premium in price obtained for Sind-American cottons during the past three years has resulted in considerable increase of area under these cottons.

Improved Egyptian and Sea Island Cottons.—Selected strains of these cottons, acclimatized in Sind, have been produced by the Sind Agricultural Department, viz. (1) *Sea Island* 2-4 and (2) *Bose* III-16, which have a staple length of $1\frac{1}{4}''$ to $1\frac{1}{2}''$ and are suitable for spinning 70 to 80's. These improved strains have been tested on field scale and are found to grow well in East Sind. They are, however, susceptible to white ant attack, specially on virgin soils, and seasonal variations. The average yield during the year 1936-37 was about 7 *maunds kapas* per acre as compared to about 12 *maunds* yielded by Sind American on good lands. These fine quality cottons require better soil and better cultivation than Sind American or *deshi* cotton. During the year 1936, the area under these cottons under supervision of Agricultural Department only was 825 acres. These cottons are not extending into the province owing to low yield in certain seasons

and want of adequate price. During 1936-37, these cottons were sold by the Agricultural Department in large quantities at the following rates :—

Variety	Sale of Cotton in 1936-37.			Remarks.
	No. of bales sold.	Rate per candy (784 lbs.)	Premium on Broach.	
		Rs. a. p	Rs.	
Sind N. R. ..	3	262 1 2	....	Government Farm produce.
	25	254 14 10		Do.
	30	220 6 0		Do.
4F-98	22	238 4 0	....	Do.
Sind Sudhar ..	145	300 3 0	....	Government and 'A' class produce.
	100	286 10 6		Do.
	5	285 14 4		Do.
	22	259 15 9		Government and 'B' class produce.
	28	259 15 6		Do.
Boss III-16 ..	32	400 0 0	150 on 250	Government Farm material.
	33	390 0 0	150 on 240	Government and 'A' class produce.
	91	375 0 0	150 on 225	District produce.
	8	386 0 0	150 on 236	
	66	380 0 0	140 on 240	

For successful cultivation of long stapled and fine quality cottons, it is necessary to evolve a reliable marketing organization which will secure adequate premium for quality from the trade. The Indian mills have of late shown considerable interest in these long stapled cottons and it is upto them to give an encouragement to the growers of these cottons for their future supply. There are few local buyers. The growers of Sind/American cotton, as also the ginners are in constant fear of not getting adequate price for staple cotton marketed in pure condition.

Extension and pure seed multiplication.—The pure seed extension scheme is based on *Unit* system, each unit representing a final area of 25,000 acres under one improved variety. In this scheme, the programme adopted for multiplication and distribution of pure seed consists of five progressive stages, viz. (1) seed patch 2½ acres (2) increase block 25 acres (3) field scale plantings 250 acres (4) Village groups 2,500 acres and (5) district groups 25,000 acres. The first three stages are under departmental supervision. The last two stages are being arranged through selective growers. Ten such units were started in the beginning to supply seed to different cotton growing tracts, but on account of large increase in area under cotton cultivation especially under medium long stapled cottons, the number of units have been increased to 24.5 units for *deshi* cotton, 18 units for improved *Sind/American* and one unit for high quality cottons. It is proposed to increase more units under *deshi* cotton.

The produce of all the stages of the seed multiplication scheme was ginned under the supervision of the Agricultural Department and about 29,500 *maunds* of seed of improved strains evolved by the Agricultural Department were distributed for sowing in the current year 1937-38.

MADRAS.—*I. The Southerns Tract—(A) Cambodia—Coimbatore.*—(*i*) The system of multiplication of pure *Co.*2 *Cambodia* seed to *ryots* still continues as in previous years and much progress has been made in this direction. With a view to the spread of this strain, seed farms are being run by annual contract with co-operative seed societies and individual *ryots*. A statement showing seed farm areas under this strain during 1935-36 and 1936-37 is given below :—

Year.	No. of societies.	No. of *ryots*.	Taluk where seed farms were run.	Area in acres.		Quantity of lint obtained.		Quantity of seed distributed.
				Acs.	cents.	Candies.	lbs.	Lbs.
1935-36 (Inner area) ..	4	130	Palladam	883	0	53	54	78,440
1935-36 (Outer area) ..	21	801	Palladam & Avanashi.	5,320	0	861	292	903,854
Total ..	25	931		6,203	0	914	346	982,294
1936-37 (Inner area) ..	4	61	Palladam	926	0	101	166	146,863*
1936-37 (Outer area) ..	23	765	Palladam & Avanashi.	5,117	23	641	124	871,318
Total ..	27	826		6,043	23	742	290	1,018,181

* Quantity of seed produced for distribution.

(*ii*) The inner area mentioned above is run under the direct supervision of the department; whereas the outer area is run by the Tiruppur Co-operative Trading Society with the help of the Agricultural Department staff consisting of one Business Manager, 6 Agricultural Demonstrators, 6 Demonstration mistries and 6 messengers, whose pay and allowances are met mainly by the Indian Central Cotton Committee and partly by the Madras Government. The seed of the inner area is exchanged with that of the outer area, for seed farm sowing, subject to the availability of the stock.

(*iii*) The estimated area under *Co.*2 *Cambodia* and the production are given in the statement below :—

	Area in acres.	*Yield in bales of* 400 *lbs.*
Coimbatore District	116,452	6,163
Salem District	20,687	9,309
	137,139	15,472

(*iv*) The seed farm lint was sold on different dates and an average premium of Rs. 6 per *candy* was obtained on the dates of sale. There is a gradual reduction in premium and it is due to the high quality of lint that is being marketed owing to the large distribution of pure *Co.* 2 seed both by the Department and by other agencies in the past few years.

2. *Cambodia—Trichinopoly.*—There were no seed farms in the Trichinopoly District. The seed supply having been limited, the area under *Co.*2 was reduced from 6,090 acres in the previous year to 5,207 acres (including a natural spread area of about 3,290 acres) in the year under report.

3. *Cambodia—Madura.*—The area under *Co.*2 strain *Nos.* 920 and 1267 *Cambodia* seed farms was 221 acres as against 172 acres in the previous year. The quantity of seed distributed during the year was as detailed below, sufficient to cover an area of 4,730 acres as compared to 31,047 lbs. of seed for 2,079 acres during 1935-36 :—

Co. 2	65,751	lbs.
Strain 1267	3,365	,,
Strain 920	1,844	,,
Total ..	70,960	,,

The estimated area under these improved varieties as a result of departmental distribution and other agencies is 41,240 acres (*Co.*2=40,461 acres, *Strain* 1267=267 acres, and *Strain* 920=512 acres). *Cambodia* in the Masipattam (February-April) season in the single crop paddy lands continues to be popular.

4. *Cambodia—Ceded Districts.*—*Co.* 2 seed was obtained from Tiruppur and distributed here. A total quantity of 2,685 lbs. of seed was sold in 1936-37 and the area under departmental seed was 314 acres as against an area of 710 acres in the previous year. The area under natural spread is estimated to be 1,278 acres as against an area of 725 acres in the previous year. It may be said definitely that owing to the small area where this cotton can be grown and marketed profitably there is no prospect of any appreciable increase in area. There are prospects, however, in the case of unirrigated *Cambodia.*

B. *I. Karunganni—Coimbatore.*—(*i*) The C.7 *Karungunni* strain of Tinnevelly tract has become very popular in Coimbatore district with a corresponding reduction in the Uppam area. A statement showing the seed farm areas under this strain during 1935-36 and 1936-37 is given below :—

Year.	No. of *ryots.*	Taluk where seed farms were run.	Area in acres.		Quantity of lint obtained.	Quantity of seed distributed.
			Acres.	cents.	lbs.	lbs.
1935-36	19	Udamalpet	542	39	25,589	58,128
1936-37	21	,,	848	0	27,493	94,364*

* Quantity produced for distribution.

(*ii*) The area estimated under this strain from both departmental and *ryots'* seed is 29,105 acres. (Coimbatore district 29,092 ; Salem district 13). The estimated yield from this area is 5,874 bales of 400 lbs. each).

2. *Karunganni—South*—(*i*) The area under *Karunganni* seed farms—*A.*10 and *K.PT.* 1—was 1,098 acres whereas it was 1,292 acres in the previous year. *KPT.* 1 is

admitted to be a better yielder than *A*.10 or *C*.7. The two latter varieties will be completely replaced by *KPT*.1 soon. The quantity of seed distributed was :—

A.10	21,725 lbs.
KPT.1	57,798 ,,
Strain 546	225 ,,
C.7	8,988 ,,
Total	88,736 ,,

which was sufficient for an area of 7,395 acres as compared to the distribution in 1935-36 of 181,693 lbs. of seed to cover 15,141 acres. The estimated area under the improved strains is 135,835 acres (*A*.10=81,965 acres, *C*.7=39,775 acres, *KPT*. 1=13,320 acres, and *Strain* 546=775 acres.)

The season was quite unfavourable for cotton and due to late rains, the sowings had to be delayed even upto the end of November in certain places. The absence of rain during the growing period resulted in a definite fall in the yield by about 30 per cent. The rains in February 1937 caused shedding of bolls.

(ii) Owing to insufficient rainfall in the Trichinopoly district the area under *C*.7 *Karunganni* in this district was reduced from 695 acres in 1935-36 to 455 acres in the year under report.

II. *Northerns and Westerns Tract.*—A. *Northerns*—(*N*. 14).—On recovery of prices, a good demand has been created for this cotton since 1935-36. Seed farms were started with a view to supply pure seed to the *ryots*. The work afresh received an impetus by the premium of Rs. 30 per *candy* of 500 lbs. lint paid by Messrs. Binny & Co., Nandyal, for the produce of the 1935-36 crop.

During 1936-37 all the seed obtained from the 1935-36 seed farm area viz., 12,730 lbs. was sold. Seed farm work was continued and an area of 78.8 acres was devoted for the purpose. The average outturn of seed cotton was low owing to the bad season, being only 127 lbs. per acre. In Koilkuntla taluk (Kurnool District), the yield was 200 lbs. of seed cotton per acre. It is gratifying to record that Messrs. Binny & Co., Nandyal, the main cotton buying firm in the tract, continued to pay a premium of Rs. 30 per *candy* of 500 lbs. lint.

The area under natural spread under *N*.14 during 1936-37 was 3,925 acres. During 1937-38 it is expected that the area might go up to 6,000 acres.

B. *Westerns—H*. 1 *Strain*.—During the year the area under seed farms was 2,554 acres, as against an area of 3,265 acres in the previous year. 1,48,087 lbs. of seed sufficient to sow about 12,500 acres was distributed during the year as compared to 69,523 lbs. of seed distributed in the previous year. The area under natural spread sown to this variety is estimated to be 2,27,000 acres as against an area of 2,14,655 acres reported in the previous year.

Owing to bad season, the yield was below normal, the average yield per acre being 25 lbs. of lint in the Bellary District and 35 lbs. of lint in the Anantapur District. This variety fetched a premium of Rs. 4 per bale of 400 lbs. lint while in the previous year the premium paid ranged from Rs. 3 to Rs. 7.

CENTRAL PROVINCES AND BERAR.—The past year witnessed a further extension in the cultivation of *V*.434 cotton. The progress of this strain was carefully watched in the field and records of its performance in the different cotton tracts of this province were maintained. There were some 20,000 acres under it during the year and once again it proved to be the best all-round strain, with remarkable adaptability to varying conditions of soil and climate. Another characteristic revealed by this cotton was the tenacity

of its burst bolls to withstand heavy rain and gale without dropping on the ground. In spinning capacity, it has maintained practically the same performance as during the past four years. In the Eastern part of Berar and the districts of Wardha and Nagpur, it has almost completely replaced other *Verum* strains and is expected to make a considerable headway in the remaining areas during the course of the next few years. Some 11,43,856 lbs. of seed of this cotton have been distributed through the agency of the Department Marketing Organisation for *Verum* cotton for sowing in the coming season. In addition, 53,557 lbs. of guaranteed pure seed, raised on the various Government Farms, has also been distributed in suitable centres.

Late *Verum* was again tested in areas for which it has been specially developed and the results obtained were in keeping with those of the previous years. But owing to the all-round suitability of *V*.434 and the desirability of having as few types as possible under cultivation in adjacent areas, it is recommended that except in places where late *Verum* shows a distinct advantage over *V*.434, the latter type is the one that should be grown.

Buri Ak. Special and Buri 107.—Climatic conditions during the past few years have been particularly suitable for these two selections from *Gossypium hirsutum*. These have been specifically developed for an area of some 50,000 acres in and around Burhanpur in the Nimar District and have met with much favour, resulting in a considerable demand for their seed.

Another feature of the year was the development to the field scale stage of four new strains of cotton viz., *B*.90, *B*.64, *B*.73 and *B*.61. These combine fineness of lint with high yield and freedom from disease. In spinning capacity, they have been adjudged suitable for spinning from 46 to 50 highest standard warp counts.

United Provinces.—The U. P. *Bengals* crop was a failure, heavy and badly distributed rain resulting in low yield, bad condition, and a high proportion of bad seed.

C.402.—The area under this strain in the Hardoi District was nearly doubled, being over 2,600 acres. The bulk of the crop was again handled successfully by the U.P. Cotton Purchase and Sale Society on a co-operative basis, and yielded a substantial premium over *Desi*. The suitability of this type for the State Tubewell areas is being examined.

C.520.—Over 17,000 acres of this hardy, high ginning *Bengals* selection were grown in the western districts, and about 1,000 acres in the Sarda Circle.

Cotton Survey.—The survey, supported by the Indian Central Cotton Committee, of the indigenous cottons of the Bundelkhand and Rohilkhand areas was completed, and considerable progress made in selection of material for trial.

Punjab.—The total area under cotton in the British districts of the Punjab during the year 1936-37 was 2,909,152 acres against 2,802,747 acres last year. Of the total area 1,361,042 acres were sown under *Punjab-American* varieties and 1,548,110 acres under *Desi* cottons. Both the total acreage of cotton and the acreage of *Punjab-American* varieties constitute fresh records for the province. The crop also established a record of production during the year and never in the previous history of the cotton crop in the province has there been such an outturn. The 1935-36 crop produced the then record of 1,371,600 bales which was 1¼ lakh bales more than the previous highest outturn in any previous year. The present year, however, out-stripped last year's high outturn by another lakh of bales and produced a new record crop of 14,67,997 bales.

The whole of the area under *Punjab-American* cotton is grown under varieties introduced by the Agricultural Department. Amongst improved *Punjab-American* cottons contain newly introduced varieties which must be reckoned on a commercial scale in the future. *L.S.S.* which is a selection of 4-*F* possessing the latter's seed characters, but having a much better staple and giving very high yields, has become extremely popular, particularly in the Lower Chenab and Lower Jhelum Canal Colonies, in spite of the fact that it is a late cotton and requires a late irrigation if the best results are to be obtained

It is estimated that the area sown under this variety at the end of the year 1936-37 was not less than 1,50,000 acres. Again the new early strain of *Punjab-American* cotton, 43-*F* evolved by the Department and approved for issue 3 years ago, has gained great popularity in the northern part of the Lower Bari Doab Colony and on inundation supply canals. It is believed that the area sown under this variety at the moment is not less than one lakh acres. The area under *K. T.* 25—a selection of 289-*F* made by the British Cotton Growing Association, Khanewal, is increasing annually.

Of the one and a half million acres under *Desi* cottons in the Punjab it is estimated that about one million acres consisted of the various improved varieties which the Department has distributed. In this connection it is of interest to note that the latest selection of *Mollisoni*, known to the Department as *Mollisoni* 39, is spreading so rapidly that the whole *Desi* cotton crop of the Canal Colonies will soon consist almost exclusively of this variety.

RAJPIPLA STATE.—Rajpipla State has since the year 1921 in operation an act prohibiting the growing of *Goghari* and other low varieties of short staple cotton and regulating by licence the working of cotton ginning and pressing factories within its territories. The State has introduced since 1921 the improved strain of long staple cotton known popularly as 1027 *A.L.F.* variety. For the last 16 years it has continued its policy for maintaining the purity of this crop throughout the State. This is achieved (i) by the annual distribution of selected seed obtained by special arrangement, (ii) by the rigorous enforcement of the provisions of the Cotton Improvement Act which penalises the sowing or importing into the State for any purpose the *Goghari* or any other short staple cotton seed and (iii) by controlling the ginning and pressing factories and rigorously seeing that no other variety is mixed with the pure 1027 *A.L.F.* crop of the State.

2. With a view to avoid any deterioration in the crop that might arise by using seed for more than two years from the local crop, during the year under report, the supply of the best quality of Navsari seed (also 1027 *A.L.F.* variety) was obtained through the good offices of the Cotton Superintendent, Surat district. The liberal policy of distributing this seed by way of *tagavi* to the cultivators of the State was continued as usual in order to maintain the high quality of the crop of the State. The outturn for the year which was 27,743 bales of full pressed cotton (excluding a stock of about 5,000 bales taken by the cultivators for ginning and pressing outside the State) may be considered quite good in view of the failure of the late rains which affected generally the outturn of the cotton crop throughout the Province of Gujerat.

3. The introduction of 1027 *A.L.F.* variety of cotton and the success it has achieved have resulted not only in the cultivators finding a ready market for their crop at their own doors but also created in them a spirit of enterprise for the disposal of their crop on co-operative lines. In order to reap the greatest benefit out of their own endeavours a number of enterprising cultivators of the State have formed themselves into a limited Co-operative Society and started a cotton ginning and pressing factory at Netrang a station on the newly opened branch railway within the State. The State extended liberal support to this movement and it is gratifying to note that the organisers found their endeavours crowned with success during the very first year of the formation of the Society.

4. The introduction of the Cotton Improvement Act and the policy of the State in relation to the growing of cotton have stimulated also the growth of meetings for the sale of cotton to the highest priced customers at the various agricultural centres in the State.

5. Rajpipla cotton is known also by the name of *Jhagadia* cotton in the market and is recognised as equal to the best and is largely sought after. It maintained during the year its high standard of purity and of superiority over short staple varieties and found a ready market at a high percentage of extra price over the standard crop throughout the season.

BARODA STATE.—(1) *Navsari District.*—Based on seed issued from the Departmental organisation the area under 1027 *A.L.F.* is about 76,000 acres. The State has now its

own cotton farm in the district and the organisation for seed is almost perfected. A larger area would be under this type, if the premium paid was commensurate with its general lower yield and lower ginning percentage compared with degenerate growths of *A*-1. The introduction of the Goghari Cotton Control Act together with propaganda is certainly reducing the percentage of this in the cultivators' fields.

(2) *Baroda District.*—*B.* 9 cotton is still being issued in areas free from wilt. *B.D.* 8, the wilt-resistant cotton, was extensively demonstrated last year and arrangements are made for seed supply and its concentrated development in certain zones. The area of *B.* 9 is probably about 1,500 acres.

(3) *Mehsana District.*—*Wagad* 8 is at present our most hopeful cotton and arrangements are being made to establish a reliable seed supply. Two of the new segregates for *Viramgam* are on trial. The Jagudan farm is now linked with this station in the Indian Central Cotton Committee Dholleras Improvement Scheme.

(4) *Amreli District.*—It cannot be said that the department has anything to offer the cultivators on which it can itself rely. The intensive studies of the *Mathio* cotton is now being taken up at the Amreli Farm.

HYDERABAD STATE.—The system of distribution of good cotton seed on *tacavi* was continued, as usual. Distribution was made of seed of the following different varieties in the various localities.

Gaorani tract.—The area under the ordinary local seed is being reduced gradually as the area under the improved types is expanding. This year, the local seed to the amount of 2,52,720 lbs. was distributed for an area of about 14,040 acres in the Nanded district. Seed of two improved types was also distributed, 28,614 lbs. of *Gaorani No.* 4, for about 1,589 acres and 71,697 lbs. of *Gaorani No.* 6, for about 3,983 acres.

Aurangabad District.—Distribution of *Banilla* seed was continued with the object to replace the local mixture, and 77,220 lbs. of seed was distributed for about 4,290 acres. Seed of an improved American type, *Parbhani-American No.* 1, amounting to 7,300 lbs. sufficient for about 405 acres, was also distributed.

Parbhani District.—Distribution of *Verum* seed was discontinued, in favour of a more promising selection of *Gaorani*. Seed of *Gaorani No.* 12, amounting to 21,044 lbs., was distributed sufficient for about 1,169 acres.

Raichur District.—Distribution of seed of improved types was continued with a view to replace the local inferior types of *Kumpta* and *Dharwar-American*. Seed of *Jayawant*, amounting to 3,26,528 lbs. sufficient for about 3,26,500 acres and of *Gadag No.* 1, amounting to 48,105 lbs. sufficient for about 4,800 acres, was distributed this year.

APPENDIX VIII.

BALANCE SHEET AS AT 31ST MARCH 1937.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Cotton Cess Receipts		1,13,27,561 13 8	I. *A. Administration*		17,90,257 8 6
Interest account:			*B. Improvement of Cotton Marketing—*		
Amount received on investments	17,32,967 9 0		1. Cost of exhibits, travelling allowance, etc.	1,00,373 10 5	
Add—Refund of income tax deducted from interest	18,072 13 0		2. Enquiry into cost of growing cotton in India	2,38,140 12 6	
	17,51,040 6 0				3,38,514 6 11
Less—			*C. Seed Distribution & Extension Schemes—*		
1. Interest paid in advance at the time of purchasing Government Paper (since recovered), interest on temporary overdrafts and Bank's commission for collection of interest	56,842 2 9		(i) *Bombay*—		
2. Interest credited to Provident Fund Account	4,886 6 2		(1) Hubli	43,402 14 7	
3. Bank's withdrawal charges for securities sold	4,377 11 0		(2) Gadag	40,766 6 1	
4. Income-tax on interest on Government securities	21,478 8 6		(3) Gadag Supplementary	20,167 11 4	
5. Brokerage for securities sold	828 10 0		(4) Surat	54,134 8 10	
6. Provision for Sinking Fund	8,293 2 0		(5) Athani	22,051 6 7	
	96,706 8 5		(6) Khandesh	1,54,684 15 4	
		16,54,333 13 7	(7) Deccan Canals (Banilla) ..	—3,404 8 1	
Profit on conversion and sale of securities ..		2,50,459 10 2	(8) B. D. 8.	3,899 14 0	
Sinking Fund Account		8,293 2 0	(9) Revised Jayawant	23,448 3 2	
Miscellaneous Receipts		46,342 2 8	(10) Gadag No. 1	8,469 8 0	
Refund from Provident Fund for contributions disallowed		3,391 1 11	(ii) *Madras*—		
Suspense receipts		23 0 0	(1) Pay and allowance of Business Manager, Tiruppur	24,038 1 2	
			(2) Co. 2	36,613 11 7	
			(3) H1.	3,952 2 9	
			(iii) Sind	2,43,404 12 1	
			(iv) Hyderabad	33,167 12 1	
			(v) Central Provinces— Extension of long staple cotton and marketing of Verum cotton.	1,85,796 5 5	
			(vi) Baroda	8,290 6 5	
			(vii) Lyallpur Ginnery	16,038 3 3	
			(viii) United Provinces C. 402	14,123 5 0	
					9,33,045 11 7
Carried over ..		1,32,90,404 12 0	Carried over ..		30,61,817 11 0

BALANCE SHEET AS AT 31ST MARCH 1937—*contd.*

RECEIPTS.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Brought forward ..	1,32,90,404 12 0	Brought forward ..		30,61,817 11 0
		D. Printing and Propaganda—		
		(1) Publicity and Propaganda	1,10,345 11 2	
		(2) Printing and Distribution	52,537 0 9	
				1,62,882 11 11
		E. Statistical Research—		
		(1) Studies of village consumption of Indian cotton	22,442 5 2	
		(2) Improvement of cotton forecasts ..	14,604 13 3	
				37,047 2 5
		II. *Technological Research—*		
		(1) *Technological Laboratory—*		
		A. Capital Expenditure :—		
		1. Land and Buildings	4,07,536 7 0	
		2. Machinery	96,690 6 10	
		3. Freight	7,502 2 8	
		4. Apparatus and equipment ..	41,558 3 7	
		5. Machinery Workshop	5,789 8 3	
		B. Working Expenses	18,53,977 14 4	
		(2) Provincial	97,143 12 3	
		(3) Development of alternative uses for Indian cottons	5,262 3 11	
				25,15,460 10 10
		III. *Research Studentships*	2,58,943 8 6	
		Less—Refunds from Mr. Taskhir Ahmad ..	597 4 0	
				2,58,346 4 6
Carried over ..	1,32,90,404 12 0	Carried over ..		60,35,554 8 8

BALANCE SHEET AS AT 31ST MARCH 1937—*contd.*

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.	Rs.	a.	p.
Brought forward ..	1,32,90,404	12	0	Brought forward ..				60,35,554	8	8
				AGRICULTURAL RESEARCH GRANTS—						
				IV. *Bombay*—						
				1. A. Surat Physiological	2,45,139	11	3			
				B. Surat Physiological Writing-up	5,814	7	8			
				2. A. Surat Bollworm	1,14,509	9	7			
				B. Surat Bollworm Propaganda	91,468	9	2			
				C. Surat Bollworm Writing-up	2,315	3	0			
				3. A. Dharwar Wilt	1,82,836	4	11			
				B. Dharwar Wilt Writing-up	10,902	10	3			
				4. Khandesh	26,573	5	0			
				5. Co-ordination of Cotton Research	1,749	7	6			
				6. Jalgaon Cotton Breeding	39,855	14	9			
				7. Broach Cotton Breeding	46,238	15	6			
				8. Small Leaf Disease Survey	3,938	9	6			
				9. Survey of Goghari Cotton	2,251	7	0			
				10. Defibration of Cotton Seed	5,443	13	3			
				11. Plant Puller Propaganda	8,897	0	0			
				12. Breeding of Wilt Resistant cottons for Surat area ..	355	0	0			
				13. Inclusion of Northerns and Westerns at Bijapur ..	....					
				V. *Madras*—						
				(*a*) Herbaceum	1,32,334	14	6			
				(*b*) Pempheres and Physiological	1,12,472	6	11			
				(*c*) Fodder Cholam	18,351	1	4			
				(*d*) Nadam Cotton Breeding	9,301	7	11			
				VI. *Punjab*—						
				(*a*) Botanical	4,97,170	15	4			
				(*b*) Entomological	2,16,653	15	9			
				(*c*) White Fly	49,153	0	7			
				(*d*) Root Rot	28,442	13	5			
				(*e*) Spraying Trials	10,812	11	3			
				(*f*) Defibrating and Delinting	6,872	10	0			
				(*g*) Survey of disease of malformation	1,730	10	6			
				(*h*) Physiological	81,728	14	6			
Carried over ..	1,32,90,404	12	0	Carried over ..	19,53,315	10	4	60,35,554	8	8

BALANCE SHEET AS AT 31ST MARCH 1937—*contd.*

RECEIPTS.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.	Rs.	a.	p.
Brought forward ..	1,32,90,404	12	0	Brought forward ..	19,53,315	10	4	60,35,554	8	8
				VII. *Central Provinces*—						
				(*a*) Botanical	4,27,740	11	3			
				(*b*) Entomological	9,564	15	0			
				VIII. *United Provinces*—						
				(*a*) Pink Boll-worm	1,47,834	1	4			
				(*b*) Rohilkhand and Bundelkhand Cotton Survey ..	18,382	10	4			
				IX. *Institute of Plant Industry, Indore*	15,44,943	12	0			
				X. *Sind*	2,54,213	13	11			
				XI. *Burma*—						
				(*a*) Capital Expenditure	2,906	15	5			
				(*b*) Cotton Improvement	47,790	3	9			
				XII. *Hyderabad*—						
				(*a*) Botanical	2,37,662	14	1			
				(*b*) Cotton Survey	37,961	0	4			
				(*c*) Pink and Spotted Bollworm	45,873	13	1			
				XIII. *Bikaner*	42,998	15	4			
				XIV. *Baroda*—						
				(*a*) Root Rot	56,888	14	10			
				(*b*) Comparative Tests	4,251	5	3			
				(*c*) Survey of Goghari Cotton	2,500	0	0			
				(*d*) Plant Puller Propaganda	5,909	11	8			
				XV. *Bengal Comilla*	9,566	7	9			
				XVI. *Mysore (Doddahathi) Cotton*	3,642	5	0			
				XVII. *Collection of Iran Cottons*	3,199	13	6			
				XVIII. *Improvement of Dholleras Cottons*	342	15	4			
				XIX. *Estimation of effects on cotton crop of use of plant puller* ..	1,287	0	0			
								48,58,778	1	6
				Loans recoverable (but considered doubtful)—						
				(*a*) Hubli Co-operative Cotton Sale Society	7,628	12	8			
				(*b*) Gadag Co-operative Cotton Sale Society	4,455	0	2			
								12,083	12	10
				By suspense account				3,641	4	0
				By closing balance				23,80,347	1	0
Grand Total ..	1,32,90,404	12	0	Grand Total ..				1,32,90,404	12	0

BALANCE SHEET AS AT 31ST MARCH, 1937.

Provident Fund Account.

RECEIPTS.	Rs. a. p.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Subscribers' contributions Account	2,31,877 10 1		By Advance to subscribers ..	41,363 15 0	
Less—Payments made to subscribers resigned	46,871 11 11		*Less*—Recoveries made up to 31st March 1937	37,661 12 0	
		1,85,005 14 2			3,702 3 0
Committee's contributions ..	2,26,720 8 10				
Less—Payments to subscribers resigned and for forfeitures for Committee's contributions disallowed	44,502 11 2		Accrued interest on Government Paper upto 31st March 1937, credited to subscribers for distribution		3,980 0 10
		1,82,217 13 8			
Suspense Deposit of Mr. Dutt's own contribution		1,085 14 1			
Investment Fluctuation Account		26,205 1 5	By Balance		3,89,859 1 2
Lapse and Forfeiture Account ..		2,026 9 8			
Suspense Receipts—Indian Central Cotton Committee Account (since adjusted)		1,000 0 0			
Total ..	....	3,97,541 5 0	Total ..	....	3,97,541 5 0

STATEMENT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31st MARCH, 1937.

RECEIPTS.	Rs.	a.	p.	Rs.	a.	p.	EXPENDITURE.	Rs.	a.	p.	Rs.	a.	p.
*Opening Balance ..	25,24,131	9	1				Administration of the Committee (including Improvement of Cotton Marketing, Seed Distribution and Extension, Printing and Propaganda, Statistical Research and Travelling Allowance of Non-official Members).				3,73,860	9	0
Less—Refunds to Dr. Pendleton, Director of Agriculture, Mozambique, and other suspense receipts in 1935-36	80	4	3				Agricultural Research Grants-in-Aid				4,85,855	3	6
							Technological Research				1,91,400	15	1
				25,24,051	4	10	Closing Balance (Government Paper at Cost) :— Rs.						
Receipts under Section 12 of the Indian Cotton Cess Act, 1923 ..				8,02,766	7	0	3½% Government of India Loan 1947-50 of the Face Value of ,, 2,75,000	2,18,032	13	0			
†Other Receipts				6,820	14	3	‡4% Government of India Loan 1960-70 of the Face Value of ,, 8,08,900	6,92,996	12	10			
Interest on Investments..				1,13,550	3	4	4½% Government of India Loan 1955-60 of the Face Value of ,, 26,000	25,004	0	0			
							5 % Government of India Loan 1939-44 of the Face Value of ,, 1,89,000	1,67,057	15	6			
							5 % Government of India Loan 1940-43 of the Face Value of ,, 3,60,000	3,98,362	8	0			
							6 % Bombay Municipal Bonds 1954 of the Face Value of ,, 50,000	56,500	0	0			
							6 % Karachi Port Trust Coupon Debentures, 1955, of the Face Value of .. .. ,, 1,30,000	1,41,212	8	0			
							6 % Rangoon Municipal Debentures 1956 of the Face Value of ,, 3,83,500	4,15,328	2	0			
							3½% Indian Sterling Bearer Bonds of the Face Value of £20,000	2,20,688	14	10			
							(Market Value on 31st March 1937 Rs. 27,54,322-3-0)	23,35,183	10	2			
							Imperial Bank of India Current Account	41,526	15	10			
							Imprests :— Rs. a. p.						
							Committee's Accounts, as certified by the Secretary .. 1,500 0 0						
							Technological Laboratory, as certified by the Director, Technological Laboratory 500 0 0						
							Director of Agriculture, Bombay Presidency, as certified by the Director of Agriculture, Bombay Presidency.. 1,365 0 0						
							Director of Agriculture, Punjab, for Cotton Research Botanist, Lyallpur, as certified by the Cotton Research Botanist, Lyallpur 150 0 0						
							Plant Physiologist, Punjab, as certified by the Plant Physiologist, Punjab 100 0 0						
							Undisbursed pay of peons of the Indian Central Cotton Committee Office 21 7 0						
								3,636	7	0			
							Suspense (Recoverable)	3,641	4	0			
							Loans Recoverable (but considered doubtful)	12,083	12	10			
							§Total Closing Balance				23,96,072	1	10
Total ..				34,47,188	13	5	Total ..				34,47,188	13	5

*Includes Rs. 7,035-0-0 on account of Sinking Fund and Rs. 12,083-12-10 against Loans Recoverable from Hubli and Gadag Co-operative Cotton Sales Societies.

†Includes Rs. 1,258-2-0 against provision for Sinking Fund for the year 1936-37.

‡ 4% Government of India Loan 1960-70 of the Face Value of Rs. 1,16,900 has been deposited with the Imperial Bank of India for security against an overdraft that may be required by the Committee.

§ Includes Rs. 8,293-2-0 on account of provision for Sinking Fund.

We have examined the above Statement of Receipts and Payments of the Indian Central Cotton Committee with the Books, Vouchers and certified Returns of the Committee, and have obtained all the information and explanations we have required and certify that to the best of our information and explanations received, the above statement is a correct abstract of the figures appearing in the Books and is drawn up in conformity with the Rules under the Indian Cotton Cess Act, 1923.

BOMBAY, 11*th May* 1937.

(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

PROVIDENT FUND ACCOUNT AS AT 31ST MARCH 1937.

RECEIPTS.	Rs. a. p.	Rs. a. p.	PAYMENTS.	Rs. a. p.	Rs. a. p.
To Opening Balance as on 1st April 1936	3,34,381 4 4		By Investment Fluctuations Account (Depreciation in Securities)		12,771 6 0
Less—Payments made during the year to a subscriber who resigned in 1935-36	23 0 4		By Balance :—		
	3,34,358 4 0		(Securities in Government Paper at Market Price)		
To Subscribers' Contributions ..	28,391 6 0		3½% Government Promissory Notes of the Face Value of Rs. 2,04,900	1,89,276 6 0	
Add—Recoveries against advances	5,044 2 0		3½% Government of India Loan 1947-50 of the Face Value of Rs. 70,500	74,025 0 0	
	33,435 8 0		5% Government of India Loan 1939-44 of the Face Value of Rs. 25,600	27,072 0 0	
	3,67,793 12 0		4% Government of India Loan 1960-70 of the Face Value of Rs. 32,600	36,063 12 0	
Less—Refunds to Subscribers who have resigned	866 11 4		6½% Bombay Municipal Debentures 1937 of the Face Value of Rs. 17,500	17,784 6 0	
Advances to Subscribers ..	5,167 13 0		Savings Bank Account with the Imperial Bank of India	5,083 14 0	
	6,034 8 4		Current Account with the Imperial Bank of India	40,553 11 2	
	3,61,759 3 8				
Committee's Contribution received from Indian Central Cotton Committee at 100 per cent.	28,391 6 0				
	3,90,150 9 8				
Less—Payments to Subscribers who have resigned including transfers to Lapse and Forfeiture Account for contributions disallowed	845 6 0				
	12,716 15 0	3,89,305 3 8	*Total Closing Balance		3,89,859 1 2
To Interest received on Investments	149 13 0				
,, Interest received on Advances to Subscribers ..	138 1 0				
Refunds of Income-tax deducted on Interest received during 1935-36	13,004 13 0				
Less—Interest paid during the year to Subscribers who have resigned:— Rs. a. p.					
On their own contributions .. 6 10 10					
On Committee's contributions .. 6 15 8					
Interest paid in advance at the time of purchase of Government Securities (since received) 462 11 6					
Income-tax deducted from interest on Investments (Recoverable) .. 292 8 2					
Bank's commission for collection of interest and cost of stamps .. 34 10 0					
Cost of Stationery, etc. 30 12 0					
	834 4 2				
		12,170 8 10			
Lapse and Forfeiture Account		154 10 8			
Indian Central Cotton Committee's Account: Excess recovery of Committee's Contributions (since adjusted)		1,000 0 0			
Total ..		4,02,630 7 2	Total ..		4,02,630 7 2

* Includes Rs. 1,085-14-1 being Suspense Deposit with interest thereon of Mr. Dutt's own contribution.

BOMBAY, 11*th May* 1937.

Examined and found correct.
(Sd.) S. B. BILLIMORIA & Co.,
Registered Accountants, Auditors.

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31ST MARCH 1937.

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital Grants on (a) Lands and Buildings.	Expenditure from Capital Grants on (b) Machinery, apparatus and other movable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES.					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
II. *Technological Research*—									
(1) Technological Laboratory :—									
(*a*) Capital Expenditure ..	5,71,399 3 8	Permanent.	1923	5,59,076 12 4	4,07,586 7 0	1,50,223 9 9	....	....	
(*b*) Working Expenses ..	18,33,822 15 7		Jan. 1924	18,53,977 14 4	....	1,316 11 7	52,001 4 3	18,01,976 10 1	
(2) Provincial :—Capital	6,151 0 0		April 1928	97,143 12 3	....	5,622 7 0	....	....	
Working	91,521 5 3			....	....	....	394 14 9	91,126 6 6	
(3) Development of alternative uses for Indian cottons	30,000 0 0	....	....	5,262 3 11	....	....	....	5,262 3 11	
Agricultural Research Grants.									
IV. *Bombay Schemes*—									
(1) Surat Physiological and Writing-up	2,91,445 0 0	10 1½	Sept. 1923	2,50,954 2 11	....	....	23,334 5 2	2,27,619 13 9	Physiological scheme closed down on 4th August 1932 and Writing-up scheme on 17th October 1933.
(2) (*a*) Surat Bollworm	1,20,720 0 0	7 7	Sept. 1923	1,14,509 9 7	....	....	4,707 8 7	1,09,802 1 0	Scheme closed down on 31st March 1931.
(*b*) Surat Bollworm Writing-up	2,420 0 0	0 4	July 1932	2,315 3 0	....	....	....	2,315 3 0	
(*c*) Surat Bollworm Propaganda and Clean-up ..	1,28,764 0 0	4 0	1st April 1931	91,468 9 2	....	....	10,828 0 11	80,640 8 3	
(*d*) Plant Puller Propaganda Scheme in Surat and Broach Districts ..	19,010 0 0	4 0	1st April 1935	8,897 0 0	....	....	817 12 6	8,079 3 6	This continuation scheme is financed from the savings of the Surat Clean-up Scheme.
(3) Dharwar :—									
(*a*) Wilt and Cotton Breeding..	2,63,545 0 0	8 11	Sept. 1923	1,82,836 4 11	....	....	13,713 3 7	1,69,123 1 4	Schemes closed down on 31st July 1932 and in July 1929.
(*b*) Writing-up	11,355 0 0	0 10	1st June 1932	10,902 10 3	....	....	....	10,902 10 3	Scheme closed down on 31st March 1933.
(4) Khandesh Cotton Breeding ..	27,995 0 0	5 5½	15th Oct. 1926	26,573 5 0	....	....	....	26,573 5 0	Scheme closed down on 31st March 1932.
(5) Co-ordination of Cotton Research	23,991 0 0	....	Not started	1,749 7 6	....	....	....	1,749 7 6	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31ST MARCH 1937—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital grants on (*a*) Lands and Buildings.	Expenditure from Capital grants on (*b*) Machinery, apparatus and other movable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
Agricultural Research Grants—(*contd.*).	Rs. a. p.	Yrs. Mths.		RESEARCH SCHEMES—*contd.* Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
IV. *Bombay Schemes*—(contd.)									
(6) Jalgaon Cotton Breeding ..	76,061 0 0	10 0	1st April 1932	39,855 14 9	....	....	*4,175 5 9	*35,680 9 0	*Provisional figures.
(7) Broach Cotton Breeding ..	1,20,910 0 0	10 0	1st April 1932	46,238 15 6	....	....	*6,232 2 6	*40,006 13 0	*Provisional figures.
(8) Survey of Small Leaf Disease of cotton	5,118 0 0	1 0	6th Nov. 1933	3,938 9 6	....	....	495 2 6	3,443 7 0	Scheme closed down on 31st October 1934.
(9) Survey of Goghari cotton in Gujarat	5,000 0 0	5 0	16th Jan. 1935	2,251 7 0	....	....	....	2,251 7 0	
(10) Defibration of cotton seed :—									
Recurring	5,250 0 0	8 0	1st Feb. 1936	....	....	....	33 6 1	1,713 4 4	
Non-recurring	3,700 0 0			5,443 13 3	....	3,697 2 10	....	....	
(11) Breeding of Wilt-resistant cottons for Surat area ..	14,385 0 0	5 7	1st April 1937	355 0 0	....	....	....	355 0 0	
(12) Cotton Wilt Breeding Scheme, Poona	42,350 0 0	5 0	1st April 1937	....	....	....	....	....	
(13) Inclusion of Northerns and Westerns in Dry Farming Scheme at Bijapur	1,780 0 0	1 0	1st June 1937	....	....	....	....	....	
V. *Madras*—									
(*a*) Herbaceum	1,47,068 0 0	14 6	Dec. 1923	1,32,334 14 6	....	....	4,431 7 0	1,27,903 7 6	
(*b*) Pempheres and Physiological ..	2,12,779 0 0	7 0	16th Sept. 1931	1,12,472 6 11	....	....	8,029 12 8	1,04,442 10 3	
(*c*) Fodder Cholam :—									
(*i*) Capital	900 0 0	6 5	14th Jan. 1931	18,351 1 4	....	881 11 7	....	....	
(*ii*) Recurring	21,010 0 0				....	....	298 14 10	17,170 6 11	Scheme closed down on 14th June 1937.
(*d*) Nadam Cotton Breeding ..	13,730 0 0	5 0	14th June 1933	9,301 7 11	....	....	411 12 9	8,889 11 2	
(*e*) Improvement of Mungari cotton	23,534 0 0	5 0	....	....	....	....	....	....	
VI. *Punjab*—									
(*a*) Botanical :—									
(*i*) Capital	31,330 0 0	14 7½	13th Aug. 1925	4,97,170 15 4	22,158 0 0	9,102 11 0	....	....	*Rs. 2,030 transferred to Capital from Working grant.
(*ii*) Working expenses ..	*6,85,650 0 0				....	....	34,915 10 9	4,30,994 9 7	
(*b*) Entomological :—									
(*i*) Capital	6,000 0 0	11 11	4th May 1926	.....	....	5,826 3 10	....	....	
(*ii*) Working expenses .. (Pink and Spotted Bollworms.)	2,49,646 0 0			2,16,653 15 9	....	....	10,051 15 2	2,00,775 12 9	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31ST MARCH 1937—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES—*concld.*					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
VI. *Punjab*—(contd.)									
(*c*) White Fly	56,087 0 0	5 5	1st May 1931	49,153 0 7	....	....	8,866 6 0	40,286 10 7	Scheme closed down on 30th September 1936.
(*d*) Root Rot	42,206 0 0	6 0	1st Sept. 1932	28,442 13 5	....	....	238 14 0	28,203 15 5	
(*e*) Spraying Trials	14,400 0 0	3 0	8th July 1933	10,812 11 3	....	....	2,402 15 9	8,409 11 6	
(*f*) Physiological (Cotton Failure Research)	2,01,587 0 0	5 0	15th Mar. 1935	81,728 14 6	....	....	11,957 3 11	69,771 10 7	
(*g*) Clean-up Campaign	52,580 0 0	2 0	1st April 1937	....	....	....	....	....	
(*h*) Defibrating and Delinting:—									
Recurring	1,000 0 0	2 0	....	6,872 10 0	....	....	17 12 0	982 4 0	
Non-recurring	6,700 0 0			....	....	5,872 10 0	....	....	
(*i*) Survey of disease of malformation	2,674 0 0	0 10	1st June 1934	1,730 10 6	....	....	....	1,730 10 6	Scheme closed down on 31st March 1935.
(*j*) Cotton Jassid Investigation ..	10,225 0 0	3 0	1st April 1937	....	....	....	....	....	
VII. *Central Provinces*—									
(*a*) Botanical	(b) 61,000 0 0	2 6	Oct. 1923	4,27,740 11 3	....	....	4,908 15 10	4,22,831 11 5	(b) The balance of this amounting to Rs.3,100-13-5 lapsed on revision.
	5,36,150 0 0	13 0	1st April 1926						
(*b*) Entomological	13,131 0 0	3 3	2nd July 1934	9,564 15 0	....	....	78 10 6	9,486 4 6	
VIII. *United Provinces*—									
(*a*) Pink Boll-worm:—									
(*i*) Capital	54,000 0 0	8 0	July 1923	.....	....	49,511 5 6	....	....	Scheme closed down on 31st July 1931.
(*ii*) Working Expenses ..	56,000 0 0			1,47,834 1 4	....	....	3,065 4 3	95,257 7 7	Scheme closed down on 12th July 1934.
(*iii*) Recurring grant for staff.	44,475 0 0	7 9½	1st Oct. 1926	....	....	....	....	....	
(*b*) Rohilkhand and Bundelkhand Cotton Survey	19,000 0 0	3 8	1st July 1933	18,382 10 4	....	....	1,529 12 1	16,852 14 3	Scheme closed down on 1st March 1937.
IX. *Institute of Plant Industry, Indore*—									
(*a*) Capital	(c) 2,83,535 12 10	Permanent	Oct. 1924	15,44,943 12 0	2,12,552 11 5	70,983 1 5	....	....	(c) Rs. 50,202-12-10 transferred from recurring grant to Capital.
(*b*) Working Expenses	12,61,407 15 2				....	....	31,857 4 4	12,29,550 10 10	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31ST MARCH 1937—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital Grants on (*a*) Lands and Buildings.	Expenditure from Capital Grants on (*b*) Machinery, apparatus and other movable property.	Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES—*contd.*					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p.	Rs. a. p.	
X. *Sind*—									
(*i*) Physiological	2,74,346 0 0	9 9	10th July 1927	2,54,213 13 11	....	....	18,912 15 9	2,35,300 14 2	
XI. *Burma*—									
(*a*) Capital	3,000 0 0	....	....	2,906 15 5	....	2,906 15 5	....	....	
(*b*) Cotton Improvement	49,032 0 0	6 0	1st April 1931	47,790 3 9	....	....	4,234 5 0	43,555 14 9	Scheme closed down on 31st March 1937.
XII. *Hyderabad*—									
(*a*) Botanical	3,65,092 0 0	9 11	10th May 1929	2,37,662 14 1	....	....	@17,461 15 10	@2,20,200 14 3	@Provisional figures.
(*b*) Cotton Survey	39,165 0 0	5 0	28th June 1931	37,961 0 4	....	....	187 11 10	37,773 4 6	Scheme closed down on 27th June 1936.
(*c*) Pink and Spotted Boll-worm and Clean-up Campaign ..	52,025 0 0 *60,959 0 0	3 4 *3 0	1st June 1933	45,873 13 1	....	....	655 15 10	45,217 13 3	*Subject to Government of India's sanction.
(*d*) Improvement of Kumpta Cotton..	32,542 0 0	5 0	28th Nov. 1937	....	....	....	....	....	
(*e*) Inclusion of Northerns and Westerns in Dry Farming Scheme at Raichur	390 0 0	1 0	1st Sept. 1937	....	....	....	....	....	
XIII. *Bikaner*—Bengals Cotton Improvement:—									
(*a*) Capital	14,500 0 0	10 0	1st Jan. 1931	42,998 15 4	8,584 6 9	3,887 13 9	....	....	
(*b*) Working Expenses	65,320 0 0				....	....	1,130 4 6	29,396 6 4	
XIV. *Baroda*—									
(*a*) Root Rot:—									
(*i*) Capital	4,000 0 0	....	....	56,888 14 10	4,000 0 0	....	....	....	
(*ii*) Recurring Expenses ..	91,569 0 0	10 4	1st Feb. 1932		....	....	4,049 15 2	48,838 15 8	
(*b*) Comparative tests of 1027 and IA cottons	4,280 0 0	2	15th April 1932	4,251 5 3	....	....	145 11 6	4,105 9 9	Scheme closed down on 15th June 1933.
(*c*) Survey of Goghari Cotton ..	5,000 0 0	5 0	1st Feb. 1935	2,500 0 0	....	....	....	†2,500 0 0	†Provisional figure.
(*d*) Plant Puller Propaganda ..	12,630 0 0 ‡17,578 0 0	2 0 ‡2 0	1st Jan. 1936	5,909 11 8	....	....	....	5,909 11 8	‡Subject to Government of India's sanction.
XV. Bengal Comilla Cotton ..	18,540 0 0	5 0	1st Dec. 1934	9,566 7 9	....	....	861 3 6	8,705 4 3	
XVI. Mysore (Doddahathi) Cotton ..	8,442 0 0	3 0	1st Nov. 1935	3,642 5 0	....	....	....	3,642 5 0	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31st MARCH 1937—*contd.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
				RESEARCH SCHEMES—*concld.*					
	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
XVII. Collection of Herbaceum cottons in Iran	4,000 0 0	....	31st Aug. 1936	3,199 13 6	....	....	....	3,199 13 6	
XVIII. *Improvement of Dholleras*—									
(*a*) Preliminary trials at Nawanagar	900 0 0	0 4	1st June 1936	342 15 4	....	....	....	342 15 4	
(*b*) Wagad cotton at Viramgam ..	27,110 0 0	5 0	1st May 1937	....	....	....	....	....	
(*c*) Mathio cotton at Amreli and Jagudan	21,570 0 0	5 0	4th June 1937	....	....	....	....	....	
XIX. Estimation of effects on cotton crop of use of Plant Pullers..	2,369 0 0 §2,369 0 0	0 6 0 6	1st Dec. 1936	1,287 0 0	....	....	2 4 0	1,284 12 0	§Subject to Government of India's sanction.
				SEED SCHEMES.					
1. *Bombay*—									
(*i*) Hubli	50,110 0 0	6 0	June 1930	43,402 14 7	....	....	5 14 0	43,397 0 7	Schemes closed down
(*ii*) Gadag	54,545 0 0	6 0	June 1930	40,766 6 1	....	....	....	40,766 6 1	on 31st May 1936.
(*iii*) Gadag Supplementary ..	21,448 0 0	4 0	10th June 1931	20,167 11 4	....	....	2,929 5 6	17,238 5 10	Scheme closed down on 10th June 1935.
(*iv*) Haveri	27,752 0 0	5 0	....	....	....	....	....	....	Scheme did not start.
(*v*) Athani	46,757 0 0	5 0	5th April 1932	22,051 6 7	....	....	1,722 15 6	20,328 7 1	Scheme closed down on 31st May 1936.
(*vi*) Bailhongal	27,425 0 0	5 0	....	....	....	....	....	....	Scheme did not start.
(*vii*) Surat	96,050 0 0	9 0	1st April 1930	54,134 8 10	....	....	....	54,134 8 10	
(*viii*) Khandesh (Banilla) ..	2,70,340 0 0 20,787 0 0	5 0 1 0	1st May 1931	1,54,684 15 4	....	....	8,503 4 11	1,46,181 10 5	Receipts amounting to Rs. 1,10,000 are anticipated in the scheme. The grant of Rs. 20,787 for the extended period takes into account anticipated receipts amounting to Rs. 6,000. This scheme closed down on the 30th April 1937.
(*ix*) Deccan Canals	24,465 0 0	5 0	1st April 1934	3,404 8 1	....	....	6 4 0	....	This scheme is self-supporting due to the anticipated receipts.
(*x*) B. D. 8	10,460 0 0	3 0	1st Dec. 1935	3,899 14 0	....	....	265 4 6	3,634 9 6	

STATEMENT SHOWING EXPENDITURE UNDER RESEARCH AND SEED EXTENSION SCHEMES UP TO 31ST MARCH 1937—*concld.*

Major Heads.	Total sanctioned grant.	Period.	Date of starting of the scheme.	Total expenditure upto 31st March 1937.	Expenditure from Capital Grants on		Expenditure from annual grants on apparatus and equipment of a permanent or semi-permanent nature.	Net working expenses, *i.e.*, staff, field experiments, labour, stores, laboratory and field contingencies including petty apparatus.	Remarks.
					(*a*) Lands and Buildings.	(*b*) Machinery, apparatus and other movable property.			
1	2	3	4	5	6	7	8	9	10
				SEED SCHEMES—*contd.*					
1. *Bombay*—(contd.)	Rs. a. p.	Yrs. Mths.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
(*xi*) Revised Jayawant and Gadag No. 1	2,66,772 0 0	(*c*) 5 0	1st June 1936	23,448 3 2 8,469 8 0	....	....	293 7 0 17 8 0	23,154 12 2 8,452 0 0	(*c*) This grant is subject to the condition that the Bombay Government bears 25% of the net cost calculated after deducting total savings under the Hubli, Gadag, Athani, Haveri and Bailhongal schemes.
(*xii*) Khandesh (Jarila) ..	13,075 0 0	0 10	1st May 1937	....	....	....	....	....	Excludes anticipated receipts amounting to Rs. 6,500.
(*xiii*) Maintenance of pure nuclei of seed of improved varieties of cotton ..	2,660 0 0	Per annum.	1st Sept. 1937	....	....	....	....	....	
2. *Madras*—									
(*i*) Pay and allowance of Business Manager, Tiruppur.	21,050 0 0 3,890 0 0	5 0 1 4	18th May 1931	24,038 1 2	....	....	162 4 0	23,875 13 2	Closed down on 14th September 1937.
(*ii*) Co. 2	81,310 0 0	5 0	15th Sept. 1932	36,613 11 7	....	....	83 13 0	36,529 14 7	Closed down on 17th August 1937.
(*iii*) H-1	18,860 0 0	2 0	(*b*)6th May 1933	3,952 2 9	....	....	....	3,952 2 9	(*b*) Closed down on 16th July 1934.
3. *Punjab Lyallpur Ginnery* ..	18,125 0 0	....	....	16,038 3 3	9,221 5 0	6,816 14 3	....	....	
4. (*i*) *Sind*..	3,89,540 0 0	8 0	1st April 1931	2,43,404 12 1	....	....	6,435 0 9	2,36,969 11 4	(*e*) The amount represents the Committee's share of the expenditure which is borne on a 50 : 50 basis between the Hyderabad State and the Committee.
(*ii*) Maintenance of a pure nuclei of seed of improved varieties of cotton ..	2,500 0 0	Per annum.	....	....	....	....	....	....	
5. *Hyderabad*	35,466 0 0 (*e*)25,799 0 0	6 6 4 6	1st March 1930	33,167 12 1	....	....	....	(*f*)33,167 12 1	(*f*) Annual Returns not yet received.
6. *Central Provinces*—									
(*i*) Verum cotton	1,17,900 0 0	3 8	1st Sept. 1930	73,544 2 5	....	....	....	73,544 2 5	Closed down on 30th April 1934.
(*ii*) Extension of Long Staple cotton and Marketing of Verum Cotton	2,18,819 0 0	5 2½	1st April 1934	1,12,252 3 0	....	....	330 0 0	1,11,922 3 0	
7. *Baroda*	25,600 0 0	5 0	16th April 1934	8,290 6 5	....	....	*217 8 0	*8,072 14 5	*Annual Return not received. Provisional figure.
8. *United Provinces* C402 ..	45,800 0 0	5 0	1st May 1935	14,123 5 0	....	....	300 0 0	13,823 5 0	

APPENDIX IX.

INDIAN RAW COTTON CONSUMED IN INDIAN MILLS.

(Based on Returns made under the Indian Cotton Cess Act, 1923, by Mills in British India, and on Voluntary Returns from Mills in Indian States).

Cotton Year: 1*st September to* 31*st August.*

(In Bales of 400 lbs. nett.)

——	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	† 1936-37
Bombay Island	762,610	987,355	731,937	747,988	435,426	542,036	766,375	664,546	611,606	565,084	491,709	687,287	664,199	636,720
Ahmedabad	262,745	273,639	286,800	264,139	298,075	318,983	344,021	321,503	322,257	348,009	373,345	326,558	320,982	304,398
Bombay Presidency.. ..	1,180,410	1,424,447	1,189,539	1,167,892	894,671	1,044,925	1,300,859	1,173,659	1,132,645	1,116,297	1,063,549	1,230,616	1,189,310	1,128,744
Madras Presidency	149,721	162,876	176,274	185,207	194,591	204,284	211,488	214,759	260,707	292,013	278,060	312,164	365,423	410,779
United Provinces	160,522	177,064	191,740	204,702	170,846	182,462	234,205	235,623	256,820	273,573	277,230	292,424	317,011	299,073
Central Provinces and Berar.	94,635	106,052	109,995	111,292	116,888	121,391	123,146	118,492	115,018	111,208	112,660	125,014	130,298	122,987
Bengal	72,535	83,553	77,949	89,763	82,086	84,212	99,075	91,993	102,390	103,784	107,633	101,101	98,892	79,944
The Punjab and Delhi ..	23,388	30,663	35,394	40,687	45,638	54,575	64,464	73,736	89,681	80,854	71,939	83,897	89,430	93,886
Rest of British India ..	12,227	14,414	17,313	13,190	15,040	22,189	24,458	27,101	30,342	31,935	35,139	38,575	38,010	35,823
Total—British India ..	1,693,438	1,999,069	1,798,204	1,812,733	1,519,760	1,714,038	2,057,695	1,935,363	1,987,603	2,009,664	1,946,210	2,183,791	2,228,374	21,71,236
Total—Indian States* ..	142,505	175,609	187,614	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341	449,314	460,060
TOTAL—INDIA	1,835,943	2,174,678	1,985,818	2,042,176	1,771,349	1,991,578	2,373,094	2,269,359	2,346,396	2,360,924	2,336,326	2,612,132	2,677,688	2,631,296

* Figures for Indian States upto and including 1930-31, being based on yarn production returns, include foreign cotton also.
† From April 1937 figures for Burma have been excluded.

INDIAN RAW COTTON CONSUMED IN MILLS IN INDIAN STATES.

(Based on Voluntary Returns from Mills in Indian States).

N.B.—Figures up to and including 1930-31, being based on yarn production, include foreign cotton also.

Cotton Year: 1st September to 31st August.

(In Bales of 400 lbs. nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Hyderabad	15,210	16,697	19,067	20,823	23,074	31,290	33,488	33,231	45,588	51,771	49,981
Mysore	43,571	44,320	39,619	46,590	43,326	49,293	50,596	47,168	51,196	50,824	53,236
Baroda	46,070	46,884	48,852	59,043	62,578	58,534	50,587	53,612	57,146	51,963	51,761
Gwalior	24,257	25,716	36,708	41,463	45,207	45,892	43,306	49,362	56,318	72,163	79,079
Indore	53,526	65,391	76,070	83,026	88,620	95,296	91,036	111,430	114,229	113,379	106,454
Kathiawar States	} 46,809	52,581	57,224	64,454	20,283	18,849	18,868	26,506	35,438	37,397	42,717
Other Indian States					32,558	39,382	40,209	45,197	45,735	51,462	57,767
Pondicherry					18,350	20,257	23,170	23,610	22,691	20,355	19,065
Total—Indian States	229,443	251,589	277,540	315,399	333,996	358,793	351,260	390,116	428,341	449,314	460,060

LOOSE (UNPRESSED) INDIAN RAW COTTON RECEIVED IN SPINNING MILLS IN BRITISH INDIA.

(Based on Voluntary Returns furnished by Mills.)

Cotton Year: 1st September to 31st August.

(In Bales of 400 lbs. nett.)

—	1926-27.	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	‡1936-37.
Bombay Presidency	28,328	24,970	27,324	24,361	54,409	74,979	80,092	74,868	58,355	75,617	76,227
Madras Presidency	35,198	39,560	52,188	46,582	55,717	99,389	96,340	110,875	123,260	147,044	173,102
United Provinces	16,991	10,308	13,878	20,441	18,496	14,367	19,236	17,871	10,090	10,405	10,659
Central Provinces and Berar	40,762	20,861	6,924	16,243	15,771	20,743	17,462	18,382	20,544	27,502	26,321
*Bengal	..	..	..	..	..	..	..	..	..	..	90
†The Punjab and Delhi	3,910	4,739	3,760	4,361	4,307	2,317	2,149	..	5,535	3,110	28,385
*Rest of British India	..	..	..	..	..	..	..	..	..	..	19,282
Total—British India	125,189	100,438	104,074	111,988	148,700	211,795	215,279	221,996	217,784	263,678	334,066
*Indian States	..	..	..	..	..	..	..	..	..	..	131,149
*Total—India	..	..	..	..	..	..	..	..	..	..	465,215

* Figures upto 1935-36 not compiled.

† Figures upto 1935-36 exclude Delhi.

‡ From 1936-37 the figures refer to consumption and not receipts and are based on returns furnished under the Indian Cotton Cess Act, 1923, by mills in British India and on voluntary returns from mills in Indian States. From April 1937 figures for Burma have been excluded.

APPENDIX X.

STOCKS OF INDIAN RAW COTTON HELD IN INDIA BY THE MILLS AND THE TRADE ON 31st AUGUST, 1936 AND 1937.

(In thousand bales* of 400 lbs. each.)

Trade Descriptions of Cotton.	Trade Stocks on 31st August.								Mill Stocks on 31st August.		Total Indian Trade and Mill Stocks on 31st Aug.	
	Bombay Island.		Karachi.		Rest of India.		Total India.		Total India.			
	1936.	1937.	1936.	1937.	1936.	1937.	1936.	1937.	1936.	1937.	1936.	1937
BENGALS—												
United Provinces	—	—	—	—	(a) 4	(a) 4	4	4	16	12	20	16
Punjab	—	—	19	35	(b) 5	(b) 6	24	41	12	20	36	61
Sind	—	—	6	10	(c) 2	—	8	10	3	4	11	14
Rajputana	—	—	2	2	—	—	2	2	15	12	17	14
Others (Unclassified) ..	19	38	—	—	—	—	19	38	1	3	20	41
Total ..	19	38	27	47	11	10	57	95	47	51	104	146
OOMRAS—												
Central Provinces—Oomras.	10	15	—	—	(d)‡ 6	(d) 5	16	20	17	31	33	51
Berar Oomras	6	38	—	—	(e) 12	(e) 9	18	47	9	15	27	62
Khandesh—Banilla ..	—	—	—	—	—	—	—	—	7	6	7	6
Khandesh Oomras ..	10	29	—	—	(f) 2	(f) 2	12	31	6	9	18	40
Central India—Malvi ..	—	—	—	—	—	(j) 4	—	4	34	42	34	46
Central India—Others ..	15	37	—	—	(g) 11	(g) 28	26	65	10	13	36	78
Barsi and Nagar Oomras..	6	28	—	—	(h) 27	(h) 45	33	73	5	6	38	79
Total ..	47	147	—	—	58	93	105	240	88	122	193	362
VERUM	—	—	—	—	—	—	—	—	12	11	12	11
HYDERABAD GAORANI ..	—	4	—	—	(h) 4	(h) 5	4	9	50	56	54	65
Total ..	—	4	—	—	4	5	4	9	62	67	66	76
AMERICANS—												
Punjab—289-F (and New Types)	28	2	—	1	(b) 1	—	29	3	16	25	45	28
Punjab (Unspecified—4-F).	7	1	64	35	(b) 10	(b) 26	81	62	89	86	170	148
Sind—289-F and F-1 ..	24	9	18	—	—	—	42	9	15	14	57	23
Sind (Unspecified—4-F) ..	2	2	28	25	(b) 1	—	31	27	18	34	49	61
Dharwar (Gadag 1) ..	—	—	—	—	—	—	—	—	4	3	4	3
Dharwar (Upland—Unspecified)..	—	—	—	—	—	—	—	—	7	4	7	4
Cambodia (Coimbatore No. 2)	—	—	—	—	—	—	—	—	62	48	62	48
Cambodia (Unspecified) ..	6	5	—	—	—	(i) 31	6	36	34	26	40	62
Total ..	67	19	110	61	12	57	189	137	245	240	434	377
BROACH—												
Surat-Navsari (Surti) ..	61	29	—	—	—	—	61	29	42	49	103	78
Broach (Unspecified) ..	118	111	—	—	—	—	118	111	43	62	161	173
Total ..	179	140	—	—	—	—	179	140	85	111	264	251
DHOLLERAS—												
Mattheo	2	32	—	—	—	—	2	32	4	3	6	35
Cutch	—	—	—	—	—	—	—	—	—	—	—	—
Wagad	—	—	—	—	—	—	—	—	28	34	28	34
Dholleras (Unspecified) ..	143	56	—	—	(c) 6	(c) 8	149	64	6	6	155	70
Total ..	145	88	—	—	6	8	151	96	38	43	189	139
SOUTHERNS—												
Kumptas (Jayawant) ..	—	—	—	—	—	—	—	—	29	29	29	29
Kumptas (Unspecified) ..	28	9	—	—	—	(k) 1	28	10	49	41	77	51
Westerns (Jowari and Mungari)	45	15	—	—	(i) §55	(i)°43	100	58	52	58	179	137
Northerns									27	21		
Coconadas (& Warangal)..	—	—	—	—	(i) 20	(i)†13	20	13	6	7	26	20
Karunganni	—	—	—	—	—	—	—	—	19	26	19	26
Tinnevellies	1	1	—	—	—	(i) 15	1	16	40	26	41	42
Salems	—	—	—	—	—	(i) 9	—	9	2	1	2	10
Total ..	74	25	—	—	75	81	149	106	224	209	373	315
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
OTHER SORTS (Unclassified)..	4	5	—	—	—	—	4	5	2	3	6	8
Total Indian Cotton ..	535	466	137	108	166	254	838	828	791	846	1,629	1,674

*Standard Indian bales of approximate average gross weight 400 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

N.B.—The detailed statement of Mill Stocks on 31st August 1937 is attached.

(a) At Cawnpore.
(b) In the Punjab.
(c) At Ahmedabad.
(d) In the Central Provinces.
(e) In Berar.
(f) In East and West Khandesh Districts.
(g) In Indore and Gwalior States.
(h) In Hyderabad State.
(i) In the Madras Presidency. Figures of trade stocks in the Madras Presidency for 1936 refer to Westerns, Northerns and Coconadas tracts. From 1937 the relevant figures cover the whole of the Presidency.
(j) In Indore State.
(k) At Bailhongal.

‡ Includes 609 bales held at Ahmedabad.
§ „ 5,000 „ in Hyderabad State.
° Includes 32,000 bales held in Hyderabad State.
† „ 1,000 „ „ „

STOCKS OF RAW COTTON HELD BY THE

(Compiled from Voluntary

*(In thousand bales**

Trade Descriptions of Cotton.	Bombay Island.	Ahmedabad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras North.	Madras South.	Total Madras Presidency.	United Provinces.	Central Provinces.	Berar.	Total C. P. and Berar.	Bengal.
BENGALS—												
United Provinces	1	—	—	1	—	—	—	6	—	—	—	1
Punjab	2	—	—	2	—	—	—	5	—	—	—	1
Sind	1	1	—	2	—	—	—	—	—	—	—	—
Rajputana	4	—	—	4	—	—	—	—	—	—	—	—
Others	3	—	—	3	—	—	—	—	—	—	—	—
Total ..	11	1	—	12	—	—	—	11	—	—	—	2
OOMRAS—												
Central Provinces Oomras.	5	—	1	6	—	—	—	—	21	1	22	1
Berar Oomras	4	—	4	8	—	—	—	—	3	3	6	—
Khandesh—Banilla ..	1	—	4	5	—	—	—	—	1	—	1	—
Khandesh Oomras ..	5	—	4	9	—	—	—	—	—	—	—	—
Central India—Malvi ..	2	1	1	4	—	—	—	—	—	—	—	—
Central India—Others ..	5	1	—	6	—	—	—	1	—	—	—	—
Barsi and Nagar Oomras..	2	—	4	6	—	—	—	—	—	—	—	—
Total ..	24	2	18	44	—	—	—	1	25	4	29	1
VERUM	1	—	—	1	—	—	—	—	7	3	10	—
HYDERABAD GAORANI ..	9	—	25	34	—	—	—	—	11	—	11	—
Total ..	10	—	25	35	—	—	—	—	18	3	21	—
AMERICANS—												
Punjab—(289-F and New Types)	12	3	2	17	3	—	3	3	—	—	—	1
Punjab (Unspecified—4-F).	13	1	—	14	—	18	18	27	—	—	—	6
Sind Sudhar-(289-F & F-1)	10	4	—	14	—	—	—	—	—	—	—	—
Sind (Unspecified—4-F) ..	9	3	—	12	—	17	17	—	—	—	—	1
Dharwar (Gadag 1) ..	1	1	1	3	—	—	—	—	—	—	—	—
Dharwar (Upland—Unspecified)	1	—	3	4	—	—	—	—	—	—	—	—
Cambodia (Coimbatore No. 2)	2	—	—	2	1	42	43	—	—	—	—	1
Cambodia (Unspecified) ..	6	—	—	6	—	16	16	—	—	1	1	2
Total ..	54	12	6	72	4	93	97	30	—	1	1	11
BROACH—												
Surat-Navsari (Surti) ..	22	13	2	37	—	3	3	—	1	—	1	1
Broach (Unspecified) ..	27	25	—	52	1	1	2	—	—	—	—	1
Total ..	49	38	2	89	1	4	5	—	1	—	1	2
DHOLLERAS—												
Mattheo	2	—	—	2	—	—	—	—	—	—	—	—
Cutch	—	—	—	—	—	—	—	—	—	—	—	—
Wagad	1	22	1	24	—	—	—	—	—	—	—	—
Dholleras (Unspecified) ..	3	2	—	5	—	—	—	—	—	—	—	—
Total ..	6	24	1	31	—	—	—	—	—	—	—	—
SOUTHERNS—												
Kumptas (Jayawant) ..	15	1	1	17	8	—	8	—	—	—	—	—
Kumptas (Unspecified) ..	14	—	11	25	2	1	3	—	—	—	—	—
Westerns (Jowari and Mungari)	14	2	12	28	13	3	16	—	—	—	—	2
Northerns	4	—	—	4	14	—	14	—	—	—	—	1
Coconadas (& Warangal)..	—	—	2	2	1	1	2	—	—	—	—	1
Karunganni	—	—	—	—	—	26	26	—	—	—	—	—
Tinnevellies	—	—	—	—	—	26	26	—	—	—	—	—
Salems	—	—	—	—	—	1	1	—	—	—	—	—
Total ..	47	3	26	76	38	58	96	—	—	—	—	4
COMILLAS	—	—	—	—	—	—	—	—	—	—	—	—
OTHER SORTS	—	—	—	—	—	2	2	—	—	—	—	1
Total Indian Cotton ..	201	80	78	359	43	157	200	42	44	8	52	21
AMERICANS	7	1	—	8	—	—	—	—	—	—	—	—
EGYPTIANS	8	6	1	15	1	2	3	—	1	—	1	—
EAST AFRICANS	19	18	6	43	—	4	4	—	1	—	1	1
OTHERS (Sudan, Mesopotamia, etc.)	14	8	1	23	2	3	5	—	—	—	—	1
Total Foreign Cotton ..	48	33	8	89	3	9	12	—	2	—	2	2
GRAND TOTAL ..	249	113	86	448	46	166	212	42	46	8	54	23

* Standard Indian bales of approximate average gross weight 400 lbs.

MILLS IN INDIA ON 31st AUGUST, 1937.

Returns furnished by Mills.)

of 400 lbs. each).

Punjab and Delhi.	Rest of British India.	Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	Grand Total.	Trade Descriptions of Cotton.
													BENGALS—
3	—	11	—	—	—	1	—	—	—	—	1	12	United Provinces
10	—	18	—	1	—	—	—	—	1	—	2	20	Punjab
—	2	4	—	—	—	—	—	—	—	—	—	4	Sind
—	7	11	—	—	—	—	—	—	1	—	1	12	Rajputana
—	—	3	—	—	—	—	—	—	—	—	—	3	Others
13	9	47	—	1	—	1	—	—	2	—	4	51	Total
													OOMRAS—
—	—	29	—	—	—	—	—	—	2	—	2	31	Central Provinces Oomras
—	—	14	—	—	—	—	—	—	1	—	1	15	Berar Oomras
—	—	6	—	—	—	—	—	—	—	—	—	6	Khandesh—Banilla
—	—	9	—	—	—	—	—	—	—	—	—	9	Khandesh Oomras
—	—	4	—	—	1	7	28	—	2	—	38	42	Central India—Malvi
—	—	7	2	—	—	—	4	—	—	—	6	13	Central India—Others
—	—	6	—	—	—	—	—	—	—	—	—	6	Barsi and Nagar Oomras
—	—	75	2	—	1	7	32	—	5	—	47	122	Total
—	—	11	—	—	—	—	—	—	—	—	—	11	VERUM
—	—	45	11	—	—	—	—	—	—	—	11	56	HYDERABAD GAORANI
—	—	56	11	—	—	—	—	—	—	—	11	67	Total
													AMERICANS—
													Punjab—(289·F and New Types)
—	—	24	—	—	1	—	—	—	—	—	1	25	
13	4	82	—	—	—	3	—	—	—	1	4	86	Punjab (Unspecified—4-F)
—	—	14	—	—	—	—	—	—	—	—	—	14	Sind Sudhar–(289-F & F-1)
—	—	30	—	—	—	—	—	—	1	3	4	34	Sind (Unspecified—4-F)
—	—	3	—	—	—	—	—	—	—	—	—	3	Dharwar (Gadag 1)
													Dharwar (Upland—Unspecified)
—	—	4	—	—	—	—	—	—	—	—	—	4	
													Cambodia (Coimbatore No. 2)
—	—	46	—	1	—	—	—	—	1	—	2	48	
—	—	25	—	—	—	—	—	—	—	1	1	26	Cambodia (Unspecified)
13	4	228	—	1	1	3	—	—	2	5	12	240	Total
													BROACH—
—	—	42	—	—	1	—	2	3	—	1	7	49	Surat-Navsari (Surti)
—	1	56	—	—	4	—	1	—	—	1	6	62	Broach (Unspecified)
—	1	98	—	—	5	—	3	3	—	2	13	111	Total
													DHOLLERAS—
—	—	2	—	—	—	—	—	1	—	—	1	3	Mattheo
—	—	—	—	—	—	—	—	—	—	—	—	—	Cutch
—	—	24	—	—	3	—	—	7	—	—	10	34	Wagad
—	—	5	—	—	—	—	—	—	1	—	1	6	Dholleras (Unspecified)
—	—	31	—	—	3	—	—	8	1	—	12	43	Total
													SOUTHERNS—
—	—	25	—	—	—	—	—	—	4	—	4	29	Kumptas (Jayawant)
—	—	28	—	13	—	—	—	—	—	—	13	41	Kumptas (Unspecified)
													Western (Jowari and Mungari)
—	—	46	—	10	1	1	—	—	—	—	12	58	
—	—	19	—	2	—	—	—	—	—	—	2	21	Northerns
—	—	5	2	—	—	—	—	—	—	—	2	7	Coconadas (& Warangal)
—	—	26	—	—	—	—	—	—	—	—	—	26	Karunganni
—	—	26	—	—	—	—	—	—	—	—	—	26	Tinnevellies
—	—	1	—	—	—	—	—	—	—	—	—	1	Salems
—	—	176	2	25	1	1	—	—	4	—	33	209	Total
—	—	—	—	—	—	—	—	—	—	—	—	—	COMILLAS
—	—	3	—	—	—	—	—	—	—	—	—	3	OTHER SORTS
26	14	714	15	27	11	12	35	11	14	7	132	846	Total Indian Cotton
—	—	8	—	—	—	—	—	—	—	—	—	8	AMERICANS
—	—	19	—	2	1	—	—	—	—	—	3	22	EGYPTIANS
—	—	49	—	1	4	—	—	1	—	—	6	55	EAST AFRICANS
—	—	29	—	1	1	—	—	—	—	—	2	31	OTHERS (Sudan, Mesopotamia, etc.)
—	—	105	—	4	6	—	—	1	—	—	11	116	Total Foreign Cotton
26	14	819	15	31	17	12	35	12	14	7	143	962	GRAND TOTAL

and net weight 392 lbs. of cleaned (lint) cotton.

STOCKS OF INDIAN COTTON ON 31st JANUARY, HELD BY THE MILLS AND THE TRADE IN THE MADRAS PRESIDENCY.

Trade Descriptions of Cotton.	Mill Stocks on 31st January.			Trade Stocks on 31st January.			Total Stocks on 31st January.		
	1935.	1936.	1937.	1935.	1936.	1937.	1935.	1936.	1937.
Tinnevellies	21	14	28	7	12	4	28	26	32
Salems	10	6	9	2	3	49	12	9	58
Cambodias	42	41	47	11	22	87	53	63	134
*Northerns & Westerns .	14	14	21	..	..	12	14	14	33
*Coconadas	†	†	†	..	..	9	..	..	9
*Outside Cottons ..	41	28	34	..	..	..	41	28	34
Total ..	128	103	139	20	37	161	148	140	300

* Mill stocks only for 1935 and 1936.

† Less than 500 bales.

APPENDIX

RECEIPTS AT MILLS IN INDIA OF

(Compiled from voluntary returns
1st September* 1936 *to
(In thousand bales*

Trade Descriptions of Cotton.	Bombay Island.	Ahmed-abad.	Rest of Bombay Presidency.	Total Bombay Presidency.	Madras Presidency.	United Provinces.	C.P. & Berar.	Bengal.	Punjab and Delhi.	Rest of British India.
BENGALS—										
United Provinces	10	1	—	11	—	78	—	3	15	—
Punjab	13	—	—	13	—	20	—	2	49	—
Sind	9	4	1	14	—	2	—	—	—	6
Rajputana	18	—	—	18	—	1	—	—	—	14
Others	11	—	—	11	—	—	—	1	—	—
Total ..	61	5	1	67	—	101	—	6	64	20
OOMRAS—										
Central Provinces Oomras	15	1	2	18	—	—	65	4	—	—
Berar Oomras	22	1	6	29	—	—	24	1	—	—
Khandesh—Banilla	5	—	9	14	—	—	1	—	—	—
Khandesh Oomras	15	1	18	34	—	—	—	—	—	—
Central India—Malvi	9	11	2	22	—	6	—	—	—	—
Central India—Others	25	5	3	33	—	15	—	1	—	—
Barsi and Nagar Oomras	12	—	20	32	—	—	—	—	—	—
Total ..	103	19	60	182	—	21	90	6	—	—
VERUM	5	—	1	6	—	—	16	—	—	—
HYDERABAD GAORANI	31	—	50	81	1	—	16	—	—	—
Total ..	36	—	51	87	1	—	32	—	—	—
AMERICANS—										
Punjab—(289-F and New Types) ..	51	13	5	69	3	5	—	2	—	—
Punjab (Unspecified—4-F)	41	6	—	47	29	101	—	25	36	4
Sind-Sudhar (289-F and F-1) ..	38	16	—	54	—	2	—	1	—	—
Sind (Unspecified—4-F)	24	14	2	40	28	—	—	3	—	—
Dharwar (Gadag 1)	5	3	2	10	—	—	—	—	—	—
Dharwar (Upland—Unspecified) ..	5	1	6	12	—	—	—	—	—	—
Cambodia (Coimbatore No. 2) ..	4	—	—	4	106	1	—	2	—	—
Cambodia (Unspecified)	15	2	—	17	45	—	2	6	—	—
Total ..	183	55	15	253	211	109	2	39	36	4
BROACH—										
Surat-Navsari (Surti)	50	39	6	95	5	—	1	2	—	—
Broach (Unspecified)	95	66	3	164	1	—	—	1	—	1
Total ..	145	105	9	259	6	—	1	3	—	1
DHOLLERAS—										
Mattheo	9	1	—	10	—	—	—	—	—	—
Cutch	1	—	—	1	—	—	—	—	—	—
Wagad	7	97	2	106	—	—	—	—	—	—
Dholleras (Unspecified)	21	5	—	26	—	—	—	—	—	—
Total ..	38	103	2	143	—	—	—	—	—	—
SOUTHERNS—										
Kumptas (Jayawant)	32	3	4	39	8	—	—	—	—	—
Kumptas (Unspecified)	28	1	16	45	2	—	—	—	—	—
Westerns (Jowari and Mungari) ..	38	6	25	69	19	—	—	5	—	—
Northerns	6	1	—	7	10	—	—	3	—	—
Coconadas (and Warangal)	1	—	2	3	4	—	—	2	—	—
Karunganni	2	—	—	2	58	—	—	—	—	—
Tinnevellies	—	—	—	—	53	—	—	—	—	—
Salems	—	1	—	1	3	—	—	—	—	—
Total ..	107	12	47	166	157	—	—	10	—	—
COMILLAS	—	—	—	—	—	—	—	—	—	—
OTHER SORTS	—	1	—	1	8	—	—	1	—	—
Total Indian Cotton ..	673	300	185	1,158	383	231	125	65	100	25
AMERICANS	24	1	—	25	—	—	—	1	—	—
EGYPTIANS	24	40	3	67	7	—	2	1	1	—
EAST AFRICANS	97	130	17	244	6	—	1	6	2	—
OTHERS (Sudan, Mesopotamia, etc.) ..	36	27	3	66	6	—	1	6	—	—
Total Foreign Cotton ..	181	198	23	402	19	—	4	14	3	—
GRAND TOTAL ..	854	498	208	1,560	402	231	129	79	103	25
Indian raw cotton consumed in mills in India. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lbs. nett).	637	304	188	1,129	411	299	123	80	94	35

* Standard Indian bales of approximate average gross

XI.

RAW COTTON CLASSIFIED BY VARIETIES.

furnished by Mills).

31*st August* 1937.

of 400 lbs. each).

Total British India.	Hyderabad.	Mysore.	Baroda.	Gwalior.	Indore.	Kathiawar States.	Other Indian States.	Pondicherry.	Total Indian States.	GRAND TOTAL.	Trade Descriptions of Cotton.
											BENGALS—
107	—	—	—	16	—	—	—	—	16	123	United Provinces
84	—	2	—	—	—	—	1	—	3	87	Punjab
22	—	—	—	—	—	—	—	—	—	22	Sind
33	—	—	—	1	1	—	11	—	13	46	Rajputana
12	—	—	—	—	—	—	2	—	2	14	Others
258	—	2	—	17	1	—	14	—	34	292	Total
											OOMRAS—
87	—	—	—	—	—	—	5	—	5	92	Central Provinces Oomras
54	—	—	—	—	—	—	3	—	3	57	Berar Oomras
15	—	—	—	—	—	—	—	—	—	15	Khandesh—Banilla
34	—	—	—	—	—	—	—	—	—	34	Khandesh Oomras
28	—	—	9	40	100	—	9	—	158	186	Central India—Malvi
49	3	—	1	1	22	—	1	—	28	77	Central India—Others
32	—	—	—	—	—	—	—	—	—	32	Barsi and Nagar Oomras
299	3	—	10	41	122	—	18	—	194	493	Total
22	—	—	—	1	—	—	—	—	1	23	VERUM
98	24	—	—	—	—	—	—	—	24	122	HYDERABAD GAORANI
120	24	—	—	1	—	—	—	—	25	145	Total
											AMERICANS—
79	—	1	1	—	—	1	3	—	6	85	Punjab—(289-F and New Types)
242	—	—	1	24	—	—	2	2	29	271	Punjab (Unspecified—4-F)
57	—	—	1	—	—	—	2	—	3	60	Sind-Sudhar (289-F and F-1)
71	—	—	1	—	—	—	1	8	10	81	Sind (Unspecified—4-F)
10	—	—	—	—	—	—	—	—	—	10	Dharwar (Gadag 1)
12	—	—	—	—	—	—	—	—	—	12	Dharwar (Upland—Unspecified)
113	—	1	—	—	—	—	4	—	5	118	Cambodia (Coimbatore No. 2)
70	—	—	—	—	—	1	—	—	1	71	Cambodia (Unspecified)
654	—	2	4	24	—	2	12	10	54	708	Total
											BROACH—
103	—	—	5	—	2	5	1	3	16	119	Surat-Navsari (Surti)
167	—	—	13	—	1	2	1	1	18	185	Broach (Unspecified)
270	—	—	18	—	3	7	2	4	34	304	Total
											DHOLLERAS—
10	—	—	2	—	—	10	—	—	12	22	Mattheo
1	—	—	1	—	—	1	—	—	2	3	Cutch
106	—	—	16	—	—	22	1	—	39	145	Wagad
26	—	—	1	—	—	—	2	—	3	29	Dholleras (Unspecified)
143	—	—	20	—	—	33	3	—	56	199	Total
											SOUTHERNS—
47	—	—	—	—	—	—	10	—	10	57	Kumptas (Jayawant)
47	—	13	—	—	—	—	1	—	14	61	Kumptas (Unspecified)
93	1	7	6	1	—	—	—	—	15	108	Westerns (Jowari and Mungari)
20	—	—	—	—	—	—	—	2	2	22	Northerns
9	8	—	—	—	—	—	—	1	9	18	Coconadas (and Warangal)
60	—	—	—	—	—	—	—	—	—	60	Karunganni
53	—	—	—	—	—	—	—	—	—	53	Tinnevellies
4	—	—	—	—	—	—	—	—	—	4	Salems
333	9	20	6	1	—	—	11	3	50	383	Total
—	—	—	—	—	—	—	—	—	—	—	COMILLAS
10	—	1	—	—	—	—	—	—	1	11	OTHER SORTS
2,087	36	25	58	84	126	42	60	17	448	2,535	Total Indian Cotton
26	—	—	—	—	—	—	—	—	—	26	AMERICANS
78	—	2	6	—	—	—	—	—	8	86	EGYPTIANS
259	—	3	22	—	1	3	—	—	29	288	EAST AFRICANS
79	—	1	2	—	—	—	—	—	3	82	OTHERS (Sudan, Mesopotamia, etc.)
442	—	6	30	—	1	3	—	—	40	482	Total Foreign Cotton
2,529	36	31	88	84	127	45	60	17	488	3,017	GRAND TOTAL
2,171	50	53	52	79	106	43	58	19	460	2,631	Indian raw cotton consumed in mills in India. (Figures compiled mainly from returns under the Indian Cotton Cess Act—Bales of 400 lbs. nett).

weight 400 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

APPENDIX XII.

EXPORTS BY SEA OF INDIAN RAW COTTON CLASSIFIED BY VARIETIES.

(Compiled from Voluntary Returns furnished by Exporters.)

1st September 1936 *to* 31*st August* 1937.

(In thousand bales* of 400 lbs. each.)

Trade Descriptions of Cotton.	Exported to				Total Exports.
	Europe (excluding United Kingdom) and the West.	United Kingdom.	Japan.	China and the East (excluding Japan.)	
BENGALS—					
United Provinces	6	4	4	—	14
Punjab	232	72	292	3	599
Sind	142	56	22	1	221
Rajputana	21	1	15	—	37
Others	1	—	1	—	2
Total ..	402	133	334	4	873
OOMRAS—					
Central Provinces—Oomras ..	37	47	66	4	154
Berar—Oomras	30	3	473	—	506
Khandesh—Banilla	1	—	—	1	2
Khandesh—Oomras	57	5	214	3	279
Central India—Malvi	20	—	19	—	39
Central India—Others	18	1	105	3	127
Barsi and Nagar—Oomras ..	13	3	70	1	87
Total ..	176	59	947	12	1,194
VERUM	2	—	—	—	2
HYDERABAD GAORANI	—	—	23	—	23
Total ..	2	—	23	—	25
AMERICANS—					
Punjab—(289-F & New Types)	8	4	15	1	28
Punjab (Unspecified—4-F) ..	182	228	474	17	901
Sind Sudhar—(289-F & F-1) ..	30	19	43	5	97
Sind (Unspecified—4-F) ..	20	37	9	4	70
Dharwar (Gadag 1)	—	—	14	—	14
Dharwar (Upland—Unspecified)	—	—	7	—	7
Combodia (Coimbatore No. 2).	4	—	20	2	26
Cambodia (Unspecified) ..	7	3	15	—	25
Total ..	251	291	597	29	1,168
BROACH—					
Surat-Navsari (Surti) ..	47	1	23	—	71
Broach (Unspecified)	55	9	48	10	122
Total ..	102	10	71	10	193
DHOLLERAS—					
Mattheo	40	3	19	—	62
Cutch	—	—	6	—	6
Wagad	2	—	—	—	2
Dholleras (Unspecified) ..	7	—	93	8	108
Total ..	49	3	118	8	178
SOUTHERNS—					
Kumptas (Jayawant) ..	—	—	3	—	3
Kumptas (Unspecified) ..	2	—	3	—	5
Westerns (Jowari and Mungari).	31	—	49	—	80
Northerns	17	7	6	—	30
Coconadas (and Warangal) ..	20	8	—	—	28
Karunganni	4	2	5	—	11
Tinnevellies	6	3	18	—	27
Salems	—	—	1	—	1
Total ..	80	20	85	—	185
COMILLAS	30	5	—	1	36
OTHER SORTS (Unclassified) ..	11	3	149	—	163
GRAND TOTAL ..	1,103	524	2,324	64	4,015
Total exports, as per official returns, from British Indian and Kathiawar Ports—Bales of 400 lbs. nett	1,226	565	2,404	72	4,267†

* Standard Indian bales of approximate average gross weight 400 lbs. and net weight 392 lbs. of cleaned (lint) cotton.

† These figures exclude exports from Burma.

APPENDIX XIII.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Progress Report for the year ended June 30th, 1937.

NOTE.—In accordance with a resolution of the Board of Governors this report has been reduced in size and is of a general nature. The detailed results of research and experiment carried out during the year have been published separately.

The Institute of Plant Industry is a Society registered under the Holkar State Societies Registration Act and its primary objects are:—

(*a*) The investigation into matters relating to the growth, nutrition and genera improvement of raw cotton in India.

(*b*) Training of research students nominated by the Indian Central Cotton Committee in cotton investigation work.

(*c*) The agricultural development of the Indian States and Territories who are members of the Society.

(*d*) The training of agricultural officers and agricultural subordinates who are sent by the States for special instruction at the Institute.

FINANCE.—

The buildings and equipment of the Institute were provided in the first instance by generous grants from the Indian Central Cotton Committee amounting to about Rs. 2,80,000 and 300 acres of land for the experimental station were given on long lease by the Holkar State at the nominal rent of Re. 1 per acre per annum.

Funds for maintenance are derived entirely from contributions. During the year under report the Indian Central Cotton Committee have contributed Rs. 1,11,000 and Rs. 51,000 have been received from the member-States. While this method of finance by annual contribution is inevitable under the constitution of the Institute, it will be realized that it is somewhat unsatisfactory from the administrative point of view. Contributions fluctuate, and the uncertainty of the financial position from year to year creates considerable difficulty when framing programmes and arranging for staff. There is also an understandable tendency for the members of the staff to seek employment elsewhere, not necessarily at higher pay, but where prospects of continuous employment are more settled.

The rate of contribution from the member-States has been fixed by the Board of Governors at Rs. 100 per *lakh* of general revenue. If contributions at this rate were received from all States the position would be sounder, but certain member-States have been permitted for various reasons either to join or to continue membership at a lower rate of contribution. This appears somewhat unfair to those States that regularly maintain their subscription at the standard rate and at the same time is inclined to lead to bargaining for admission by prospective members.

The financial year 1936-37 opened with a deficit of Rs. 3,000. By means of exercising every possible economy and due to the receipt of some arrear contributions from States the year closed with a balance of Rs. 1,000. It should be emphasized, however, that it was only possible to achieve this by refraining from the purchase of necessary stores and replacements and that if in the future such very drastic economy becomes necessary the work of the Institute is bound to suffer.

The accounts of the Institute had previously been audited by a firm of Chartered Accountants, but in consonance with a recent resolution of the Board of Governors the accounts for the year 1935-36 were audited for the first time by the outside Audit Department of the Accountant General, Central Revenues. The audit report was satisfactory but certain changes in the office routine have been introduced to meet the requirements

of the Audit Department. The buildings belonging to the Society have been valued by the Central Division, Public Works Department, and a register of the immoveable property of the Society opened.

Board of Governors.—The work and policy of the Institute is regulated by a Board of Governors. This Board consists of representatives appointed by the Indian Central Cotton Committee and the member-States, the number appointed to the Board by each body being in proportion to the contribution received. The Resident for Central India is, *ex-officio*, President of this Board.

A meeting of the Board was held in November 1936. In addition to the usual business transacted the Board passed a resolution expressing their appreciation of the services of Mr. J. B. Hutchinson, the Geneticist and Botanist, who retired during the year. At the same meeting arrangements were made for the appointment of his successor.

In February 1937, a Committee consisting of Rao Bahadur Viswanath, Officiating Director, Imperial Institute of Agricultural Research, Dr. J. N. Mukerjee, Professor of Chemistry, Calcutta University and the Director, Institute of Plant Industry, met in accordance with a Board of Governors' resolution to consider the programme and staffing of the Chemistry and Agronomy Section. Their report has been prepared and will be considered by the next Board meeting.

Staff and Students.—During the year considerable changes have taken place in the staff of the Institute. Mr. F. K. Jackson retired from the Directorship in July 1936, and his place was taken by Mr. T. R. Low, I.A.S.; Mr. J. B. Hutchinson, the Geneticist and Botanist, left in April 1937, to take up an appointment in Trinidad. Mr. K. Ramiah of the Madras Agricultural Service has been appointed in his place. Mr. M. P. Singh, a voluntary research student in the Genetics and Botany Section was appointed by the Indian Central Cotton Committee to the post of Cotton Research Officer at Rangamati (Bengal) in the Comilla Cotton Breeding Scheme, and Messrs. G. K. Govande and B. S. Kocharekar, two other research students in the same Section, secured appointments as Plant Breeders in Baroda.

Research Students for the Institute are now selected by the Research Students Selection Sub-Committee of the Indian Central Cotton Committee. During the year two such studentships were offered and Mr. D. Ganesan from Madras University was appointed to one post. The second remained vacant as no candidate of sufficient merit presented himself.

States contributing to the Institute.—At the closing date of this report the following States and Thikanas were members of the Institute, arranged in order of joining :—

Indore	Bijawar	Alwar
Dhar	Barwani	Khetri
Jaora	Bikaner	Bagli
Datia	Rewa	Jhabua
Rutlam	Jaipur	Chhatarpur
Dewas I	Bundi	Sikar
Sitamau	Partabgarh	Karauli
Narsingarh	Orchha	Dewas II
Tonk	Jodhpur	

It is pleasing to note that during the year the Darbar of Dewas II decided that the State should become a contributing member of the Institute and this State therefore joined in October 1936. Negotiations are still proceeding with certain other States who are considering taking advantage of membership. No State has resigned membership though several, for various reasons, are still contributing at less than the agreed scale.

Visitors.—Sir John Russell, the Director of the Rothamsted Experimental Station, during his tour in India on behalf of the Imperial Council of Agricultural Research, stayed

at the Institute for three days. He carefully investigated the work in progress and indicated the lines on which he considered developments in the Chemistry and Agronomy Section should proceed. His suggestions were duly considered by the Committee which investigated the work of this Section in February 1937. Among a number of other visitors during the year were the following :—

H. H. the Maharajah of Orchha and party.
Thakur Raghuraj Singh of Nagod.
Mr. Y. S. Chen, Cotton Improvement Institute, Nanking, China.
Thakur Anandpal Singh of Ambala.
Mr. A. W. Thompson, Senior Marketing Officer, Government of India.
Sir Joseph Bhore, Financial Adviser, Bhopal State.
Lt.-Col. R. N. Chopra, I.M.S. School of Tropical Medicine, Calcutta.
Mr. F. W. Andrews, Plant Pathologist, Sudan Agricultural Department.
The President and Members of the Board of Governors.
A Party of Daly College Kumars.

Visitors are very welcome and can be shown the work in progress at any time. It is always gratifying, and a source of encouragement to the staff to receive visits from outside and to feel that interest is being taken in their activities. Such visits promote co-operation and progress on all sides.

Library.—Accessions during the year were :—

Textbooks and works of reference	51
Complete volumes of journals	140
Reports and Pamphlets	388

Loans of 153 books and journals were made to research workers in India and to officers of the member-States. About a dozen books and journals were borrowed from other Institutions for reference purposes. Exchange of publications has been extended to include practically all Agricultural Departments of India and important foreign experiment stations. Publications of the Institute and those of the Indian Central Cotton Committee, Bombay, numbering 7,498 copies, were distributed to member-States and Indian and foreign Institutions on the mailing list of the Institute. Binding of journals is up-to-date. The Library is organized on the Decimal System of Classification and all books and other material received during the year have been accessioned under that system.

From the sale section of the Library, 1187 books, bulletins, etc., were sold to the value of Rs. 599-10-0.

Publications.—The following publications and papers have been produced by members of the Institute staff during the year :—

(1) "The Introduction of Improved Strains of Crop Plants in Central India and Rajputana."—J. B. Hutchinson and V. G. Panse., *Agriculture and Livestock in India.* (1936) 6, 397.

(2) "The Delimitations of Areas for Strains of Agricultural Crops with Special Reference to Cotton."—V. G. Panse, read at the Conference of Scientific Research Workers on Cotton in India (March 1937).

(3) "A Genetical Study of Roots in Relation to Disease Resistance in Cotton."—V. G. Panse and A. F. Patel (Baroda), *Ind. Jour. Agricul. Sci.* (1937).

(4) "On an Attempt to Use Hand Spinning for Testing Quality in Cotton."—J. B. Hutchinson and V. G. Panse, *Agriculture and Livestock in India* (1937) 7, 339.

(5) "An Examination of an Analysis of a Serial Experiment."—J. B. Hutchinson and V. G. Panse, *Agriculture and Livestock in India* (1937), 7, 332.

(6) "Classification of the Cottons of Asia and Africa."—J. B. Hutchinson and R. L. M. Ghose, *Ind. Jour. Agri. Sci.* (1937).

(7) "Studies in Crop Ecology I. The Composition of Cotton Crops of Central India and Rajputana."—J. B. Hutchinson and R. L. M. Ghose, *Ind. Jour. Agri. Sci.* (1937), 7, 1.

(8) "Genetics of Gossypium and its Application to Cotton Breeding."—J. B. Hutchinson, P. D. Gadkari and M. A. Ansari, read at the Conference of Scientific Workers on Cotton in India (March 1937).

(9) "On the Occurrence of 'Crinkled Dwarf' in G. Hirsutum L."—J. B. Hutchinson and R. L. M. Ghose, *Journal of Genetics.*

(10) "The distribution of Gossypium and the Evolution of the Commercial Cottons."—J. B. Hutchinson, Read at the Conference of Scientific Research Workers on Cotton in India (March 1937).

(11) "Genetic Principles and the Problem of Gross-Breeding for Milk Yield in Indian Cattle."—J. B. Hutchinson and N. R. Joshi.

(12) "Some Notes for the Use of State Agricultural Officers in Central India and Rajputana. (Institute Publication.)"—T. R. Low, Director.

(13) "An analysis of the efficiency of selection methods used in the improvement of *Malvi* Cotton."—J. B. Hutchinson and Kubersingh, *Ind. Jour. Agri. Sci.* (1936) 6,672. Papers read in the Agricultural Section of the 24th meeting of the Indian Science Congress held at Hyderabad (Deccan) in 1937.

Abstracts published in proceedings of the Indian Science Congress.

(1) The problem of irrigating *rabi*-crops in the Gang Canal Colony, Bikaner State, by S. Shamsher Singh, Agricultural Officer, Bikaner State, and G. K. Sant.

(2) The Spacing of *Desi* Cotton (Cawnpore 520) in the Gang Canal Colony, Bikaner State, by S. Shamsher Singh, Agricultural Officer, Bikaner State, and G. K. Sant.

(3) Efficiency of different methods of manuring wheat in Rajputana, by K. R. Joshi and T. C. Kala, Jaipur State, and G. K. Sant.

(4) Compost as a top-dressing to sugarcane in Malwa by G. C. Tambe and B. Goswami.

(5) Soil fertility and moisture relationships in relation to growth and yield of rain-grown cotton in Malwa, by P. M. Salvekar and G. K. Sant, Indore.

Paper read at a Symposium on "Nitrogen in Indian Soils" held by the Indian Society of Soil Science and published in the proceedings of the National Institute of Sciences.

(6) Nitrogen and Carbon status in relation to soil productivity, by Yeshwant D. Wad and R. K. Aurangabadkar.

At the discussion at the joint meeting of the Sections of Agriculture, Geology and Geography at the 24th Session of the Indian Science Congress.

(7) Survey of Indian Soil, by Y. D. Wad.

At the discussion at the joint meeting of the Sections of Medical and Veterinary Research, Physiology, Agriculture and Chemistry at the 24th Session of the Indian Science Congress.

(8) Soil condition and composition of food material, by Y. D. Wad.

Propaganda and Extension Work.—This forms one of the most important branches of the Institute's activities in relation to work carried out for the contributing States. It

is only by introducing into the general agricultural routine of the cultivators the improvements that have been worked out by research and experiment that any real advance can be made. There are great possibilities of improvement and development in a number of directions and an excellent beginning has been made in many States. It is hoped with the general realization of the importance of agricultural development to the country that this work will be maintained and extended.

Great importance, therefore, is laid upon this side of the work and every endeavour is made to maintain as close a touch as possible with the State Agricultural Departments and to help and encourage all forms of development work carried out by them. In addition to personal visits by the Director, the Institute maintains an Extension Officer whose duties are entirely confined to propaganda and extension work in the States. This officer, besides making visits in the ordinary course of his duties, attends large agricultural shows and *melas* with agricultural exhibits, posters and leaflets for display and demonstration. On these occasions he is usually accompanied by the Institute cinematograph operator with his machine, who, where the necessary electric light facilities exist, shows agricultural and other films of interest, a running commentary and explanations being provided by the Extension Officer during the show. During the year twelve such *melas* were attended at ten of which a cinematograph show was staged. In this connection our thanks are due to the Indian Central Cotton Committee and the Railway Publicity Board for the loan of suitable films to supplement our own supply. At these agricultural shows, in addition to a display of exhibits, demonstrations are conducted with improved implements and processes, such as the Sindewahi *gur* boiling furnace, composting and *kans* ploughing. Books, bulletins, pamphlets and leaflets dealing with various forms of agricultural improvement are on sale and are distributed free.

It is unfortunate that the season for these *melas* is very restricted, several usually being in progress at the same time in the months of February and March. Owing to this the number of shows that the Extension Officer is able to attend is limited inspite of the fact that every effort is made to prepare his programme to include as many as possible. Close touch with the States is maintained by periodical visits of the Director and other members of the staff of the Institute and by reciprocal visits of Officers of the States to the Institute for the purpose of keeping abreast of the latest developments. In addition, special courses of instruction are run at the Institute for the training of the nominees of States in particular subjects such as tobacco curing, silage making, statistics as applied to agricultural experimental work, and other special subjects. It will be realized that the contributing States vary much in size and in their potentialities for agricultural improvement, but it is pleasing to note that in a number of cases real interest is being taken, money spent, and efforts made to raise the level of agriculture by many of the accepted methods of improvement, such as maintenance of State Farms for experimental and seed multiplication work, seed and implement distribution, demonstrations of compost making, silage making and *gur* and sugar making.

Farm.—Except for sharp frosts in the cold weather the season has been normal and averagely favourable. No serious epidemic occurred among the farm cattle.

During the year 75 acres of the farm were under experimental plots. In addition to work on cotton, trials of various kinds were in progress on sugarcane, tobacco, wheat, barley, lucerne, paddy and soyabean. The remaining 153 acres were cropped as under :—

Crop.	Area in acres.	Average yield in standard mds. per acre.
Cotton	63.2	2.7
Tuer	14.1	6.6
Groundnuts	2.0	5.0
Jowar	4.0	13.0
Wheat	28.0	5.0
Linseed	16.45	4.0
Gram	25.75	3.0

Provision of training.—During the year 80 persons from seventeen contributing States and elsewhere received practical training at the Farm in various subjects. These included

Agricultural Officers from States, farm menials from States, cultivators and students. In addition to those who actually came for training a considerable number of cultivators and others interested in rural development visited the farm to look round and to get an idea of what was going forward.

Implements and Seeds.—The usual sale of implements and seed was carried on from the farm. Sales of implements during the year amounted to Rs. 2,500 and of improved seed, other than cotton, to Rs. 1,500. Four hundred cartloads of compost, equivalent to about 4,000 *maunds*, was produced from farm residues.

Weather.—The rainfall distribution at Indore during the year was somewhat unusual. The monsoon of 1936 commenced on 21st June, and 8 inches of rain fell in that month. July and August gave 9 inches rain, and September 11 inches. October was rainless but 6 inches of rain early in November was of great benefit to the coming *rabi* crop and to the countryside in general. The cold season was notable for severe frost which came at the end of December and in the first week of January, which is earlier in the season than it is usually experienced. This frost cut down the standing tobacco on the farm and completely killed all the cotton. The loss of the cotton was not, however, so serious as it might have been, as, owing to the open weather during the monsoon, the crop had come on well and early and the greater part had already been picked. The total monsoon rainfall of 34" though less than usual was up to the average, cotton being good both in quantity and quality. Rainfall during the winter season was insignificant.

Cattle.—It is now generally recognized that any improvement in arable agriculture and in the economic condition of the rural population is largely dependent upon, and must be accompanied by efforts to improve the condition of the cultivator's cattle both from the point of view of work and milk production. With this end in view several of the contributing States to the Institute maintain breeding herds for the production of high class bulls or are purchasing such bulls for distribution.

In the Holkar State the breeding farm for Malwa bulls was carried on during the year and also the breeding herd in Jaipur State. The Dewan Bahadur of Dhar State personally interests himself in the breeding of Sindhi cattle. The States and Tikhanas of Khetri, Sikar, Dewas Senior Branch and Karauli are also interested, while Jodhpur State has a comprehensive scheme of livestock improvement under consideration.

It is also gratifying to note that side by side with breeding and improvement work the popularity and use of the Burdizzo castrator is gaining ground in several States and the necessity for the castration of worthless scrub bulls is becoming recognized.

Research Work.—(*i*) *Classification of cotton.*—This study referred to in last year's report was pursued, and a classification both complete and in a form acceptable to cotton workers was published during the year by Mr. J. B. Hutchinson. This, together with his paper "The Distribution of *Gossypium* and the Evolution of Commercial Cottons" read before the Conference of Cotton Workers at Bombay in March 1937, gives a clear insight into the evolutionary progress leading to the development of the present day sympodial annual cottons under cultivation from the wild, highly monopodial perennial shrubs.

(*ii*) *Botanical Survey.*—With the preliminary study of the indigenous and introduced cottons of Kathiawar undertaken by the Institute staff in 1935, a large number of promising single plants had been selected in the Wagad cottons. Pending the sanction of the Dholleras Cotton Improvement Scheme by the Indian Central Cotton Committee, these were grown at Alibada farm, Nawanagar. The produce of these plants was examined at the Institute and the pick of the material was sent to Viramgam. At the request of the Bhopal Darbar a survey of the cotton area of the State was made by the Geneticist and Botanist with a view to suggest possibilities of improving cotton cultivation in Bhopal. The crop composition in Bhopal was found to be very similar to that in Malwa except that the proportion of the Uplands was very much lower than in Malwa.

(*iii*) *Iranian Tour.*—One assistant was sent to Iran during the year to study the cotton areas there and collect samples of *herbaceum* cotton likely to be useful for breeding work in India. As would be seen from the report submitted to the Indian Central Cotton Committee the *herbaceum* cotton of Iran exhibited great variability and a large number of single plants representative of the different regions was brought back by the assistant together with some bulk samples. It is hoped that the Iran material will be particularly useful for the breeding scheme at Viramgam.

(*iv*) *Selection for quality.*—Cotton samples belonging to the *arboreum* var. *neglectum* group had been received some time back from the Shan and Chin States of Burma, from Assam and from the Frontiers of Assam, Burma and Bhutan. These have been grown in the Institute and selection made for quality combined with good ginning percentage. While in several cases the selection for quality has been obtained at the expense of ginning percentage, families have been obtained from the material with lint lengths of over 25 m.m. and ginning percentage of 35 which should be a great improvement for *neglectum* cottons. The pick of this material has also been used in hybridisation in connection with the Bengals Improvement Scheme in progress at Sriganganagar. The study of the material would seem to indicate the necessity for a survey of this tract for better material, just as has been done in the case of Iran.

Study of the old literature having pointed to the fact that portions of India now growing predominantly short staple cotton originally grew medium or long staple cottons, search was made for better quality material in Malwa, the Nerbada valley, parts of Rajputana, Bundelkhand and Rohilkhand.

There are selections from the material collected in Malwa and Nimar which while giving the same yield and ginning percentage as Malvi 9 are capable of spinning higher counts than this strain. The Rohilkhand and Bundelkhand material which has been tried in four different places simultaneously, i.e., Indore, Sriganganagar, Raya and Cawnpore, has not proved very promising. The material from parts of Rajputana has given selections with lint over 24 m.m. long and with a ginning percentage over 30. Several of the promising selections are under trial at Indore and Sriganganagar.

(*v*) *Selection and Breeding.*—The principle of basing selection on variance as well as mean values has been exploited by the replicated progeny row technique that has been evolved at the Institute. A detailed account of the technique will soon appear in the Indian Journal of Agricultural Science. During the year two experiments, one on Malvi cotton and the other on *Jowar* were carried out to test the efficiency of selection by the special technique.

(*vi*) *Physiology.*—A botanical analysis of the published data on spinning quality and hair characters has shown that the two are not related. Experiments were carried out to determine whether handspun yarns on the *takli* or *charkha* could be used to estimate fibre properties. Such tests made with selected strains of Malvi cottons on which Technological reports were available showed that the results obtained from the hand spinning tests did not agree with those from the Technological Laboratory. The method of estimating hair fineness by measuring the swollen diameter of the hair after treating it with caustic soda has been tried and a close relationship was found between the swollen diameter and the spinning value. The technique is now being regularly used in the Institute as a routine in plant breeding work.

Experiments have been conducted to determine whether the better performance of the Upland cotton as a mixture with *desi* than as a pure crop was due to the effects of competition between the two. Various degrees of competition were artificially induced in the experiment. The results were not comparable with last year's results due to the abnormal season. The indication of gain in yield in the types when grown in association with each other was again brought out. Complementary to the above experiment another

has been conducted for two years to determine the proportion of the two types from year to year starting with mixtures in definite proportions. The results so far available show that in mixtures with a high proportion of the Upland type this type tends to fall rapidly. Again there has been a tendency for the proportion of the Upland to increase rapidly in mixtures where it was only in a small proportion to begin with.

(*vii*) *Variety Trials.—Rajputana.*—Cawnpore 520, Mollisoni and P289F were compared in randomized blocks at the State farm at Sriganganagar and in cultivators' fields both in the light soil and on the heavier *Ghaggar* bed soils. While the trials on the *Ghaggar* bed were a failure due mainly to bad germination, in the light soils P289F gave good results. The season happened to be particularly favourable to American cottons. Cawnpore 520 was just as good as the other *desi* cottons in one trial and distinctly better in the other. The great difficulty with American cotton appears to be its unreliable performance from season to season. Even in good seasons the seed of the American variety does not fully mature and this is found to be an inherent trouble with the American types when grown in this tract. While the trials with P289F might be continued Cawnpore 520 appears to be the most promising cotton for this area.

Another experiment was conducted to see if there was any advantage in thinning the stand both at Sriganganagar and in the *Ghaggar* bed. At Ganganagar the increased yield of 31 pounds per acre was only just sufficient to meet the extra labour charge involved in thinning. On the *Ghaggar* bed there was no significant difference between the treatments. Thinning might be of advantage only where a good initial stand might be generally expected. Because of the existence of several natural factors such as white ants, hot winds, and dust storms which themselves affect the stand in this tract, deliberate thinning of the crop does not appear to be either necessary or desirable.

In the trials carried out at three centres in Jaipur State both under *barani* and irrigated conditions Cawnpore 520 appears to be the most suitable variety for the tract thus confirming last year's observations. It has a distinctly higher ginning outturn than the local, and an equal or higher yield. Trials at Ajmer-Merwara again showed that Cawnpore 520 was suitable to the greater portion of the tract. Under irrigation in loamy soils as in Makrera, Indore 1 appeared equally promising.

The trials in Jodhpur were mostly failures for various causes. But the indication obtained last year that Indore 1 was suitable to the tract was again confirmed. This area together with portions of Ajmer-Merwara appears to be the only part of Rajputana where American cotton is found to do as well as *desi* cotton.

In cotton trials in Bundi State, Cawnpore 520 did not excel the local cotton markedly either under *barani* or under irrigated conditions. The most promising line of improving the local crop would appear to be to start selection work in it.

Malwa.—In Malwa the previous trials having conclusively proved the suitability of Malvi 9, the only trial conducted during the year was with the substrains of Malvi 9, at four centres, Indore, Kharua, Dhar and Sitamau. Out of the five substrains, two are definitely inferior to Malvi 9 in quality and a third gave the lowest yield in all the trials. Of the remaining two, No. 20 appears to be the more suitable to replace Malvi 9. While giving the same acre yield as Malvi 9, No. 20 is definitely superior to Malvi 9 in quality.

Nimar.—Varietal trials were conducted at Kukshi, Dhamnod, and Barwani. In these the yields at Kukshi and Barwani were very poor due to insufficiency of rains. At Dhamnod where the yield was good there were no significant differences among the varieties. The Malvi selections though better than the local cotton in quality were poor in yield and ginning percentage.

STAFF AND RESEARCH STUDENTS OF THE INSTITUTE OF PLANT INDUSTRY AS ON 30TH JUNE 1937.

Administrative and Clerical :—

Director and Agricultural Adviser to States in Central India & Rajputana	T. R. Low, B. Sc., Agri. (London), M.C., I.A.S.
Personal Assistant	A. N. Srivastava, M.Sc. (Lucknow).
Head Clerk and Accountant ..	G. M. Nadkarni.
Camp Clerk	M. Mohiuddin Khan.
Assistant Clerk	S. M. Ajmi.
Assistant Clerk	Basantlal Ganpatsa.
Junior Clerk	S. M. A. Azim.
Despatcher	V. R. Shirsath.
Artist	S. J. Onkar.
Librarian	Bashir Husain Khan.

Genetics and Botany :—

Geneticist and Botanist	K. Ramiah, L. Ag., M.Sc., Dip. Agri. (Cantab.)
Senior Botanical Assistant	R. L. M. Ghose, M.Sc. (Allahabad).
Statistician	V. G. Panse, B.Sc. (Bombay).
Genetical Assistant	Bholanath, M.Sc. (Punjab).
Plant Breeding Assistant	C. P. Dutt, M.Sc. (California).
Extra Assistant	K. M. Simlote, B.Ag. (Nagpur).
2nd Botanical Assistant	P. D. Gadkari, M.Sc. (Nagpur).
2nd Plant Breeding Assistant ..	M. A. A. Ansari, M.Sc. (Lucknow).
Fieldman	E. L. Rajanna.
Computor	S. A. Khargonekar.
Research Student	D. Ganesan, M.Sc. (Madras).

Chemistry and Agronomy :—

Chemist and Agronomist	Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.
Chemical Assistant	R. K. Aurangabadkar, M.Sc. (Allahabad).
Agronomic Assistant	K. N. Ambegaonkar, M.Sc. (Bombay).
Laboratory Assistant	G. T. Shahane.
Laboratory Assistant	L. N. Desai, B.Sc. (Agra).
,, ,, ...	G. K. Sant. B.Sc. (Agra).
,, ,, ...	S. J. Ghose, B.Sc. (Calcutta).
,, ,, ...	B. Goswami, B.Sc. (Calcutta).
,, ,, ...	P. M. Salvekar, B.Sc. (Bombay).
,, ,, ...	Y. Subha Rao, B.Sc. (Mysore), B.Ag. (Bombay)

Propaganda and Extension Work :—

Extension Officer	Kubersingh, B.Ag. (Bombay).

Farm Staff :—

Farm Superintendent	G. C. Tambe, B.Ag. (Bombay).
Assistant Farm Superintendent ..	S. C. Talesara, B.Ag. (Bombay).
Junior Farm Assistant	V. N. Bhargava, B.Sc. (Allahabad).
,, ,, ,, ...	S. S. Gangadhar Bhotla, B.Ag. (Bombay).
Fieldman	Nihalsingh.
,, ...	V. R. Sathe.
,, ...	G. M. Nigudkar.
Storekeeper	S. J. Rathod.

INSTITUTE OF PLANT INDUSTRY, INDORE.

Programme of work for 1937-38—*Genetics and Botany Section.*

Cotton.

(1) *Genetics.*—Study of inheritance of major factors in Asiatic and Indian American cottons.

Study of the inheritance of quantitative characters.

Study of interspecific hybrids with special reference to the bearing of heterosis on plant breeding procedure.

Study of the rate of mutation in mutable strains.

(2) *Cytology.*—Study of sterile types derived from an interspecific hybrid, (*G. arboreum* × *G. herbaceum*).

Study of chromosome behaviour in F_1, F_2 and back-crosses of *G. anomalum* x cultivated Asiatic cottons.

(3) *Physiology.*—Study of hair characteristics. Development of tests for lint quality suitable for the needs of the plant breeder. Study of relative selection values of four simple genetypes in Malwa and Nimar.

(4) *Selection and Breeding.*—Propagation and distribution of Malvi 9.

Study of and re-selection in progeny rows of 1933 selections and Dhar mass Malvi. Study of problems of transference of *herbaceum* quality to Malvi type.

Study of Cambodia selections grown at Badnawar.

Study of selections in Nimar *desi* made in 1933 and grown in 1934 at Dhamnod.

(5) *Statistics.*—The investigations in progress into statistical problems involved in field testing, strain testing where very small quantities of seed are available, and in the examination of segregating progenies, will be continued. Statistical methods for use in the study of quantitative inheritance will be developed with special reference to Pearson and Nyeman's L tests.

Other Crops.

Work on other crops will be largely confined to the selection and purification of desirable high yielding strains for the main areas served by the Institute, and fundamental research will usually be restricted to cotton. Exceptions from this rule will occur from time to time when opportunities arise of solving general problems more easily than could be done on cotton, and plant breeding material will, of course, be used to the fullest possible extent to provide data of scientific value.

(1) *Genetics.*—Study of inheritance of certain characters in local *durum* wheats.

(2) *Selection and Breeding.*—Selection and breeding work will be continued on the following crops:—

Kharif.	*Rabi.*
Jowar	Wheat.
Bajra	Barley
Tur	Gram
Tilli	Linseed
Niger	Kesari
Groundnut	Safflower

A part at least of the breeding material in these crops will be grown on the farms of member-States.

(3) *Lathyrism.*—Work on Kesari is being continued and in connection with it, the botanical and agricultural problems involved in the growth of the associated weeds responsible for lathyrism are being studied.

Subject No. 4.—Programme of work for 1937-38.

Section of Chemistry and Agronomy.

Nutrition and growth of cotton.

(*a*) *Pot cultures.*—Cultures for further study on the interactions of the surface and lower soil horizons with and without added nutrients in black cotton soil. The indications in the field up to the present are that in good soils the expected response to manures has been obtained. For poorer soils further investigation is required.

(*b*) *Laboratory work.*—(1) Estimation of plant food removed by cotton at different stages of growth under differing ranges of fertility i.e., to ascertain the nutrients absorbed in different stages of growth by high and low yielding plants. (Indore and Sriganganagar soils).

(2) Analysis of soil round growing plants of known differences of yield and growth in correlation with (1) above.

(3) Examination of leaves of normal and abnormal plants for minerals, carbohydrates and nitrogen.

(*c*) *Field work.*—Agronomical field trials n different tracts of Rajputana and at Indore to test the applicability in practice of results and indications obtained from pot cultures and laboratory work.

(*d*) *Continuation of current work.*—Immediate and cumulative effect on the cotton crop in rotation in respect of :—

(1) Previous cultivation and crop.

(2) Fallowing.

(3) Humus supply.

(e) *Dry farming of cotton in Jaipur*—effect of bunding.

Other crops.

Sugarcane and rice.

Selections and tests from collected varieties to be carried out in different areas. Investigation into manuring, water supply, planting and harvesting.

General.—Routine analysis. Replies to agronomical queries, design, guidance and reporting on field tests.

APPENDIX XIV.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1937.

	INDIAN CENTRAL COTTON COMMITTEE OFFICE.		
1.	Secretary	*Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from the Central Provinces Department of Agriculture.
2.	Publicity Officer	Mr. R. D. Mihra, M.A., Agri. (Oxon.), Post-Grad., Dip. Agri. (Oxon.), Post-Grad., Res. B. Litt. (Oxon.).	——
	TECHNOLOGICAL LABORATORY, BOMBAY.		
3.	Director	Dr. Nazir Ahmad, M.Sc., Ph. D. (Cantab.), F. Inst. P.	Late Head of Science Department, Islamia College, Lahore.
4.	Spinning Master	Mr. V. V. Gupte, B.Sc., (Tech.)	——
5.	Senior Research Assistant (Chemist) ..	Mr. D. L. Sen, M.Sc., Tech. (Manch.), M.Sc. (Bom.), A.I.I. Sc., F.I.C.	Research Student at the Indian Institute of Science and Manchester College of Technology.
6.	Senior Research Assistant (Physicist) ..	Mr. N. Hari Rao, M.Sc. (Calcutta)	Research Scholar, Technological Laboratory (Textile Physics).
7.	Senior Research Assistant (Physicist) ..	Mr. Ram Saran Koshal, M.Sc. (Punjab) ..	Do. do.
8.	Junior Research Assistant (Microscopist).	Mr. Amar Nath Gulati, M.Sc. (Punjab) ..	Imperial Institute of Veterinary Research, Mukteswar, U.P.
9.	Junior Research Assistant	Mr. C. Nanjundayya, M.Sc. (Calcutta) ..	Research Scholar, Technological Laboratory (Textile Physics).

* Assumed charge on the 4th October 1937.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

10.	Junior Research Assistant	Dr. K. R. Sen, D.Sc. (Dacca)	Research Scholar, Technological Laboratory, and Technological Assistant, Lyallpur.
11.	Statistician and Personal Assistant ..	Mr. V. Venkataraman, M.A. (Madras) ..	Statistical Assistant, Labour Office, Government of Bombay, Bombay.
12.	Electrician	Mr. Herculano Lobo, L.E.E. (V.J.T.I.) ..	——
13.	Spinning Assistant	Mr. N. Iyengar	——
14.	Senior Tester	Mr. H. B. Joshi, B.Sc.	——
15.	Senior Tester	Mr. S. S. Sukthanker, L.T.C. (V.J.T.I.) ..	——
16.	Junior Tester	Mr. R. G. Panvalkar, B.Sc.	——
17.	Junior Tester	Mr. G. D. Bhide, B.Sc...	——
18.	Junior Tester	Mr. K. V. N. Nayar	——
19.	Junior Tester	Mr. V. N. Modak, B.Sc.	——
20.	Junior Tester	Mr. L. V. Sundararaman, B.A.	——
21.	Junior Tester	Mr. P. S. Sambamurthy	——
22.	Junior Tester	Mr. G. J. Kharkar, B.Sc.	——
23.	Junior Tester	Mr. Sassoon Samson, B.Sc.	——
24.	Junior Tester	Mr. A. J. Farid	——
25.	Junior Tester	Mr. U. K. Benegal, B.A.	——
26.	Junior Tester	Mr. P. V. Nachane, B.Sc.	——
27.	Junior Tester	Mr. C. S. Ramanathan B.Sc.	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

TECHNOLOGICAL LABORATORY, BOMBAY—*contd.*

28.	Junior Tester	Mr. S. N. Rao, M.Sc.		—
29.	Junior Tester	Mr. B. N. Prabhakar, B.Sc.		—
30.	Junior Tester	Mr. S. M. Nawaz, B.Sc.		—
31.	Draughtsman	Mr. B. G. Mehta		—
32.	Statistical Clerk	Mr. R. Krishna Iyer		—
33.	Statistical Clerk	Mr. P. K. Wagle		—
34.	Mechanic	Mr. J. B. Kharas		—

INSTITUTE OF PLANT INDUSTRY, INDORE.

35.	Director	Mr. T. R. Low, B.Sc., (Agri.) (London), I.A.S.	Principal, Agricultural College, Cawnpore. On deputation from the United Provinces Department of Agriculture.
36.	Geneticist and Botanist	Mr. K. Ramiah, L.Ag., M.Sc., Dip. Agri. (Cantab).	Paddy Specialist to the Madras Government. On deputation from the Madras Department of Agriculture.
37.	Chemist and Agronomist	Mr. Y. D. Wad, M.A., M.Sc. (Bombay), A.I.I.Sc.	Research Student, Indian Central Cotton Committee.
38.	Farm Superintendent	Mr. G. C. Tambe, B.Ag. (Bombay)	—
39.	Extension Officer	Mr. Kuber Singh, B.Ag. (Bombay)	—
40.	Senior Botanical Assistant	Mr. R. L. M. Ghose, M.Sc. (Allahabad)	—
41.	Assistant Farm Superintendent	Mr. S. C. Talesara, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.
42.	Personal Assistant	Mr. A. N. Srivastava, M.Sc. (Lucknow)	—
43.	Statistical Assistant	Mr. V. G. Panse, B.Sc. (Bombay)	—

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

INSTITUTE OF PLANT INDUSTRY, INDORE—*contd.*

44.	Genetical Assistant	Mr. Bholanath, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.
45.	Plant Breeding Assistant	Mr. C. P. Dutt, M.Sc. (Calif.)	——
46.	Extra Assistant	Mr. K. M. Simlote, B.Ag. (Nagpur)	——
47.	Botanical Assistant	Mr. P. D. Gadkari, M.Sc. (Nagpur)	King Edward Memorial Inland Research Scholar at I.P.I.
48.	Second Plant Breeding Assistant ..	Mr. M. A. A. Ansari, M.Sc. (Lucknow) ..	Research Student, Institute of Plant Industry, Indore.
49.	Chemical Assistant	Mr. R. K. Aurangabadkar, M.Sc. (Allahabad)	Do. do.
50.	Agronomical Assistant	Mr. K. N. Ambegaonkar, M.Sc. (Benares) ..	Do. do.
51.	Junior Farm Assistant	Mr. V. N. Bhargava, B.Sc. (Allahabad) ..	Do. do.
52.	Junior Farm Assistant	Mr. S. S. Gangadhar Bhotla, B.Ag. (Bombay)	——
53.	Artist	Mr. J. S. Oncar	——

BOMBAY RESEARCH SCHEMES.

(i) *Broach Cotton Breeding Scheme.*

54.	Cotton Breeder	Mr. P. L. Patel, M.Sc. (Iowa, U.S.A.) ..	——
55.	Botanical Assistant	Mr. S. J. Patel, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.
56.	Botanical Assistant	Mr. M. S. Pandya, B.Ag., B.Sc. (Bombay) ..	Do. do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

BOMBAY RESEARCH SCHEMES—*contd.*

(*ii*) *Jalgaon Cotton Breeding Scheme.*

57.	Botanical Assistant	Mr. T. R. Khadilkar, B.Ag.	On deputation from Bombay Department of Agriculture.	
58.	Botanical Assistant	Mr. N. D. Deshpande, B.Ag. (Bombay)	—	

(*iii*) *Poona Cotton Wilt Breeding Scheme.*

59.	Agricultural Overseer	Mr. J. D. Ranadive, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee.	
60.	Agricultural Overseer	Mr. Y. S. Kulkarni, B.Ag. (Bombay)	—	

(*iv*) *Cotton Wilt Breeding Scheme for Surat Area.*

61.	Agricultural Overseer	Mr. S. P. Shah, B.Ag. (Bombay)	—	

(*v*) *Dholleras—Wagad Cotton Breeding Scheme, Viramgam.*

62.	Agricultural Overseer	Mr. R. J. Naik, M.Ag. (Bombay)	On deputation from Bombay Department of Agriculture.	

BOMBAY SEED DISTRIBUTION SCHEMES.

(*i*) *Surat Scheme.*

63.	Cotton Assistant	Mr. V. D. Desai, Matric	Do.	do.
64.	Cotton Assistant	Mr. V. V. Patel, B.Ag. (Bombay)	Do.	do.

(*ii*) *Khandesh (Jarila) Scheme.*

65.	Superintendent, Bhadgaon Farm	Mr. H. U. Vora, B.Ag.	Do.	do.
66.	Cotton Supervisor	Mr. R. B. Nimbalkar, B.Ag. (Bombay)	Do.	do.

(*iii*) *B. D.* 8 *Scheme.*

67.	Agricultural Overseer	Mr. D. A. Dave, B.Ag. (Bombay)	—	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

BOMBAY SEED DISTRIBUTION SCHEMES—*contd.*

(*iv*) *Jayawant and Gadag No.* 1. *Scheme.*

68.	Agricultural Overseer	Mr. B. S. Patil, B.Ag. (Bombay)	——	
69.	Agricultural Overseer	Mr. B. M. Dhumma, B.Ag. (Bombay) ..	——	
70.	Agricultural Overseer	Mr. B. S. Tadsur, B.Ag. (Bombay)	——	
71.	Agricultural Overseer	Mr. D. V. Hiremath, B.Ag. (Bombay) ..	——	
72.	Agricultural Overseer	Mr. S. M. Tippashetti, B.Ag. (Bombay) ..	——	
73.	Agricultural Overseer	Mr. S. F. Chandrannavar, B.Ag. (Bombay) .	Worked as District Supervisor in the Economics Enquiry Scheme.	
74.	Agricultural Overseer	Mr. S. T. Aralelimath, B.Sc. (Ag.)	——	

BOMBAY COTTON FORECAST IMPROVEMENT SCHEME.

75.	Provincial Officer	Mr. G. R. Ambekar, School Final	On deputation from Bombay Department of Agriculture.	

SIND SEED DISTRIBUTION SCHEME.

76.	Cotton Supervisor, Indus Left Bank ..	Mr. H. A. Idnani, B.Ag. (Bombay)	Research Student, Indian Central Cotton Committee, on deputation from Sind Department of Agriculture.	
77.	Cotton Supervisor, Indus Right Bank ..	Mr. W. P. Shahani, B.Ag. (Bombay).. ..	On deputation from Sind Department of Agriculture.	
78.	Senior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Agha Khan Mahomed, 2 years' Lyallpur Course.	Do.	do.
79.	Senior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. B. Arain, B.Ag. (Bombay), C.H.D. (Manchester).	Do.	do.
80.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Lekhraj Parmanand	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

SIND SEED DISTRIBUTION SCHEME—*contd.*

81.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. W. R. Shahani, F.Y.A.	On deputation from Sind Department of Agriculture.	
82.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Gulshah, U. B.	Do.	do.
83.	Junior Assistant to Cotton Supervisor, Indus Right Bank.	Mr. Premsing T. Advani, F.Y.A.	Do.	do.
84.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. A. G. Pirzada, B.Ag. (Bombay)	Do.	do.
85.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. J. D. Advani, B.Ag. (Bombay)	Do.	do.
86.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. R. M. Ranji, Dip. Ag. (Bombay) ..	Ten years under Sind Physiological Scheme.	
87.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Tharumal, K. S.	On deputation from Sind Department of Agriculture.	
88.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Naraindas, T. T.	——	
89.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. S. M. Khalsa, B.Ag. (Bombay)	——	
90.	Junior Assistant to Cotton Supervisor, Indus Left Bank.	Mr. Lachmandas, M. S.	——	

CENTRAL PROVINCES RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

91.	Economic Botanist for Cotton	*Mr. D. N. Mahta, B.A. (Oxon.), F.L.S. ..	On deputation from Central Provinces Department of Agriculture.	

* Since appointed Secretary of the Committee.

CENTRAL PROVINCES RESEARCH SCHEMES—*contd.*

(i) Botanical Scheme—contd.

92.	Assistant to Economic Botanist for Cotton.	Mr. S. C. Roy, L.Ag., and Post-Graduate, Pusa.	On deputation from Central Provinces Department of Agriculture.	
93.	Assistant to Economic Botanist for Cotton.	Mr. S. S. Pande, M.Sc. (Punjab)	Research Student, Indian Central Cotton Committee.	
94.	Assistant to Economic Botanist for Cotton.	Mr. D. G. Sawargaonkar, L.Ag. (Hons.) ..	On deputation from Central Provinces Department of Agriculture.	
95.	Assistant to Economic Botanist for Cotton.	Mr. D. L. Janoria, L.Ag. (Hons.)	Do.	do.
96.	Assistant to Economic Botanist for Cotton.	Mr. D. Y. Bhand, L.Ag. (Hons.)	Do.	do.
97.	Assistant to Economic Botanist for Cotton.	Mr. V. N. Paranjpe, B.Sc. (Allahabad) ..	——	

(ii) Entomological Scheme.

98.	Agricultural Assistant	Mr. M. S. Patel, B.Ag.	——
99.	Agricultural Assistant	Mr. S. A. Raja Rao	——

COMBINED LONG-STAPLE COTTON AND MARKETING OF VERUM COTTON SCHEMES IN C. P. AND BERAR.

100.	Agricultural Assistant	Mr. J. P. Tiwari, B.Ag.	——
101.	Agricultural Assistant	Mr. L. P. Khare, B.Ag.	——
102.	Agricultural Assistant	Mr. G. N. Wardadkar, B.Ag.	——
103.	Agricultural Assistant	Mr. L. B. Deshpande, B.Ag.	——
104.	Agricultural Assistant	Mr. N. B. Chincholkar, B.Ag.	——
105.	Agricultural Assistant	Mr. J. N. Kelkar, B.Ag.	——
106.	Agricultural Assistant	Mr. G. C. Tiwari, Certificate Course of Agricultural College, Nagpur.	——

COMBINED LONG-STAPLE COTTON AND MARKETING OF VERUM COTTON SCHEMES IN C. P. AND BERAR.—*contd.*

107.	Agricultural Assistant	Mr. M. D. Anadeo, B.Ag.	——
108.	Agricultural Assistant	Mr. Rafat Ali Haqqani, B.Ag.	——
109.	Agricultural Assistant	Mr. K. S. S. Chowhan, B.Ag.	——
110.	Agricultural Assistant	Mr. R. S. Shiwalkar, B.Ag.	——
111.	Agricultural Assistant	Mr. V. S. Hingankar, B.Ag.	——
112.	Agricultural Assistant	Mr. T. N. Puranik, B.Ag.	——

MADRAS RESEARCH SCHEMES.

(*i*) *Herbaceum Scheme.*

113.	Gazetted Assistant	Mr. R. Balasubramania Ayyar, B.A., B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.
114.	Junior Assistant	Mr. G. Seshadri Ayyangar, M.A.	——
115.	Junior Assistant	Mr. V. Ramaswami Mudaliar, B.A.	——

(*ii*) *Pempheres and Physiological Scheme.*

116.	Bio-Chemist	Dr. S. Kasinatha Ayyar, B.A., Ph.D. (London).	On deputation from Madras Department of Agriculture.
117.	Physiological Botanist	Mr. T. R. Narayana Ayyar, B.A. (Cantab.), B.Sc. (Ag.).	Do. do.
118.	Parasitologist	Mr. P. N. Krishna Ayyar, B.A.	Do. do.
119.	Assistant Botanist	Mr. K. Dharma Rajulu, M.Sc. (Bombay). ..	Research Student, Indian Central Cotton Committee.
120.	Assistant Entomologist	Mr. V. Margabandu, M.A.	On deputation from Madras Department of Agriculture.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

MADRAS RESEARCH SCHEMES.—*contd.*

(*ii*) *Pempheres and Physiological Scheme.—contd.*

121.	Assistant Botanist	Mr. N. G. Narayanan, B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.	
122.	Assistant Entomologist	Mr. P. S. Narayanaswamy, B.Sc. (Ag.). ..	Do.	do.
123.	Assistant Chemist	Mr. K. Saptharishi, B.Sc. (Ag.).	Do.	do.
124.	Assistant Botanist	Mr. A. Ramdoss, B.Sc. (Ag.).	Do.	do.

(*iii*) *Breeding of Nadam Cotton.*

125.	Assistant	Mr. R. Krishnamurthi, B.Sc. (Ag.).	On deputation from Madras Department of Agriculture.	

PUNJAB RESEARCH SCHEMES.

(*i*) *Botanical Scheme.*

126.	Cotton Research Botanist	Mr. Mohammad Afzal, B.Sc. (Agri.) (Punjab), A.I.C.T.A. (Trinidad).	Research Student, Indian Central Cotton Committee, and State Research Scholar. On deputation from Punjab Department of Agriculture.	
127.	Assistant to Cotton Research Botanist .	Chaudhri Mohammad Akbar, L.Ag.	On deputation from Punjab Department of Agriculture.	
128.	Extra Assistant Director of Agriculture (Cotton).	Bh. Sarup Singh, L.Ag., M.Sc. (Texas), U.S.A.	Do.	do.
129.	Agricultural Assistant	Bh. Ranbir Singh, B.Sc. (Agri.)	Do.	do.
130.	Agricultural Assistant	S. Kehr Singh, B.Sc. (Agri.)	Do.	do.
131.	Agricultural Assistant	Bh. Autar Singh, B.Sc. (Agri.)	Do.	do.
132.	Agricultural Assistant	Bh. Santokh Singh, B.Sc. (Agri.)	Do.	do.
133.	Agricultural Assistant	S. Fateh Ali Shah, B.Sc. (Agri.)	Do.	do.

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*i*) *Botanical Schemes—contd.*

134.	Agricultural Assistant	Ch. Kanshi Ram, B.Sc. (Agri.), Gold Medalist.	——	
135.	Agricultural Assistant (B Class) ..	Mr. S. E. Daniel, L. C. (Course)	On deputation from Punjab Department of Agriculture.	
136.	Agricultural Assistant (B Class) ..	Ch. Mohammad Rashid Khan, L.C. (Course), Munshi Fazil, (F. A., Punjab University).	Do.	do.
137.	Statistical Assistant	Mr. Bhagat Ram Sehgal, M.A. (Punjab) ..	——	

(*ii*) *Entomological (Pink and Spotted Boll-worm) Scheme.*

138.	Assistant Cotton Entomologist ..	Mr. M. Haroon Khan, B.Sc. (Hons.) (London), A.R.C.S. (London).	——
139.	Agricultural Assistant	Mr. M. Mohd. Abdul Ghani, B.Sc. (Agri.) ..	——

(*ii*) *Scheme for Clean-up Campaign of Spotted Boll-worm.*

140.	Agricultural Assistant	Pt. Ganda Ram, B.Sc. F.E.L.	——
141.	Agricultural Assistant	Mr. Ladha Ram, B.Sc.	——
142.	Agricultural Assistant	Mr. Manzoor Abbas, B.Sc. (Agri.)	——

(*iii*) *Root Rot Scheme.*

143.	Assistant Cotton Mycologist	Dr. R. S. Vasudeva, B.Sc., Ph. D. (London), D.I.C. (London).	——
144.	Agricultural Assistant	Mr. Mohd. Ashraf, B.Sc. (Agri.)	——
145.	Agricultural Assistant	Ch. Mohd. Rafiq, M.Sc. (Hons.)	——

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31st, 1937—*contd.*

PUNJAB RESEARCH SCHEMES—*contd.*

(*iv*) *Physiological (Periodical Partial Failure) Scheme.*

146.	Plant Physiologist	Prof. R. H. Dastur, M.Sc., F.L.S.	On deputation from Bombay Educational Department.
147.	Assistant Physiologist and Microscopist.	Dr. S. S. Verma, D.Sc. (Madras), Ph.D. (London), D.I.C.	——
148.	Soil Assistant	Dr. A. M. Sheikh, M.Sc. (Bombay), Ph. D. (London), D.I.C., A.I.C.	——
149.	Bio-Chemist	Dr. K. M. Samant, M.Sc., Ph. D.	——
150.	Chemical Assistant	Mr. A. A. Ahad, B.Sc. (Agri.)	——
151.	Physiological Assistant	Bh. Sucha Singh, B.Sc. (Agri.)	——
152.	Research Assistant	Dr. J. J. Chinoy, M.Sc. (Bombay), Ph. D. (London), D.I.C.	——
153.	Field Assistant	Bh. Mukhtar Singh, B.Sc. (Agri.)	——
154.	Statistical Assistant	Mr. Kanwar Kishan, M.A. (Punjab)	——

HYDERABAD RESEARCH SCHEMES.

(*i*) *Botanical Scheme*

155.	Cotton Research Botanist	Rai Sahib Kalidas Sawhney, M.Sc. (Punjab) .	Late Cotton Breeder in the Department of Agriculture, Iraq, Baghdad.
156.	Assistant Cotton Research Botanist ..	Mr. D. V. Narayanayya, Dip. Agri. (Poona) .	On deputation from Bombay Department of Agriculture.
157.	Assistant Cotton Research Botanist ..	Mr. V. K. Bederker, B.A. (Madras), B.Ag. (Bombay).	On deputation from H. E. H. the Nizam's Department of Agriculture.
158.	Inspector, Variety Testing Stations ..	Mr. N. R. Yardi, B.Ag. (Bombay)	——

HYDERABAD RESEARCH SCHEMES—*contd.*

(*ii*) *Hyderabad (Pink and Spotted Boll-worm) Scheme.*

159.	Cotton Entomologist	Mr. H. D. Nangpal, M.Sc. (Hons.) (Punjab)..	Research Student, Indian Central Cotton Committee and Assistant Entomologist, United Provinces Pink Boll-worm Scheme.	
160.	Senior Research Assistant	Mr. N. T. Nadkarny, B.Ag. (Bombay), Post-Graduate Course in Entomology at Poona Agricultural College.	——	
161.	Junior Research Assistant	Mr. T. E. Krishnaswamy, B.Sc. (Agri). (Coimbatore).	——	

HYDERABAD SEED DISTRIBUTION SCHEME.

162.	Inspector	Mr. M. V. Chitnis	——	

BARODA RESEARCH SCHEMES.

(*i*) *Root Rot Scheme.*

163.	Breeding Assistant	Mr. A. F. Patel, B.Ag. (Bombay)	——	
164.	Mycological Assistant	Mr. G. H. Desai, B.Ag. (Bombay)	——	

(*ii*) *Plant Puller Propaganda Scheme.*

165.	Plant Puller Officer, Baroda District ..	Mr. K. M. Desai, B.Ag.	——	
166.	Plant Puller Propagandist, Navsari District.	Mr. R. S. Patel	——	

LIST OF SCIENTIFIC AND TECHNICAL OFFICERS PAID FROM THE INDIAN CENTRAL COTTON COMMITTEE'S FUNDS AS ON AUGUST 31ST, 1937—*concld.*

BIKANER BENGALS COTTON IMPROVEMENT SCHEME.

167.	Cotton Assistant	Mr. Arjan Singh, B.Sc...		——

BENGAL COMILLA COTTON SCHEME.

168.	Cotton Research Officer	Mr. Maya Prakash Singh, M.Sc. (Lucknow) .		——

MYSORE (DODDAHATHI) SCHEME.

169.	Junior Assistant Botanist	Mr. K. Gopala Iyengar, M.Sc. (Bombay) ..		——
170.	Field Assistant	Mr. G. Srinivasa Iyengar, M.Sc. (Mysore) ..		——

TECHNOLOGICAL ASSISTANTS PAID BY INDIAN CENTRAL COTTON COMMITTEE.

171.	Under Cotton Specialist, Coimbatore ..	Mr. R. L. N. Iyengar, M.Sc.	Research Student, Indian Central Cotton Committee.	
172.	Under Deputy Director of Agriculture, S. D., Dharwar.	Mr. H. R. Nayak, Inter Science (Madras) ..	Formerly Junior Tester at Technological Laboratory, Bombay.	
173.	Under Deputy Director of Agriculture, Gujerat, Surat.	Mr. Srinagabhushana, B.Sc. (Mysore) ..	Research Student, Indian Central Cotton Committee.	
174.	Under Cotton Research Botanist, Lyallpur.	Mr. S. Raja Raman, B.A. (Madras), M.Sc. (Benares), A. Inst. P. (London) .	——	
175.	Under Botanist, Agricultural Research Station, Sakrand.	Mr. K. S. Marar, B.A. (Madras), LL.B. (Bom.)	Formerly Junior Tester at Technological Laboratory, Bombay.	
176.	Under Cotton Research Botanist, Hyderabad—Deccan.	Mr. K. G. Deo, Inter Arts.	Do.	do.

APPENDIX XV.

RESEARCH STUDENTSHIPS.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	Sohan Singh Bindra, M.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	——	Late Assistant Entomologist, Pink Bollworm Research Scheme, Punjab. Recently in Agricultural Department, Kenya.
,,	Mohammad Afzal, B.Sc. (Punjab).	Do.	Cotton Botany (Plant Breeding).	Punjab Agricultural Department. Cotton Research Botanist, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
,,	Sheo Shankar Pande, M.Sc. (Punjab).	Nagpur	Do. ..	Assistant to Economic Botanist for Cotton, Central Provinces Botanical Research Scheme.	Do.
,,	Jiwan Singh, M.Sc. (Punjab).	Do.	Cotton Mycology ..	Reader in Botany, Khalsa College, Amritsar.	Late Senior Mycological Assistant, Central Provinces Wilt Investigation Scheme.
,,	Ilabanto Banerji, M.Sc. (Calcutta).	Coimbatore.. ..	Cotton Botany ..	University Lecturer in Botany, Calcutta University, from 31st January 1929.	Held a Senior Research Studentship under Dr. M. A. Sampathkumaran, M.A., Ph.D., Central College, Bangalore, and at the Institute of Plant Industry, Indore, from April 1926 to March 1928.

RESEARCH STUDENTSHIPS.—*contd.*

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1923	B. B. Desai, B.Ag. (Bombay).	Dharwar	Cotton Botany ..	Sind Agricultural Department, Cotton Breeder, Sind, Mirpurkhas.	Held a Senior Research Studentship at the Institute of Plant Industry, Indore, from July 1926 to June 1927.
1924	Atul Chandra Dutta, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Lecturer in Botany, Cotton College, Gauhati, Assam.	....
,,	N. Hari Rao, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics.	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	H. D. Nangapal, M.Sc., Honours School (Punjab).	Cawnpore	Cotton Entomology.	Entomologist, Hyderabad Pink and Spotted Bollworm Scheme, Parbhani.	Late Special Research Assistant, Pink Bollworm Investigation, United Provinces.
,,	Sant Bahadur Singh, M.Sc. (Benares Hindu University).	Surat	Cotton Physiology.	....	Resigned in August 1924 to go to Cambridge for further study. Obtained Ph.D.
1925	Vishwa Ram Singh, L.Ag. (Agricultural College, Cawnpore).	Cawnpore	Cotton Entomology.	United Provinces Subordinate Agricultural Service.	Late Research Assistant under the Entomologist to Government, United Provinces—Pink Boll-worm Investigation Scheme.
,,	Akbar Ali, B.Sc. (Punjab) ..	Lyallpur	Cotton Botany (Plant Breeding.)	Punjab Agricultural Department, Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1925	Kidar Nath Trehan, M.Sc. (Punjab).	Lyallpur	Cotton Entomology.	Punjab Agricultural Department, Assistant Cotton Entomologist, White Fly Investigation Scheme, Punjab.	Held Senior Research Studentship for study of "White Fly" problem at Khanewal. Indian Central Cotton Committee.
8 ,,	S. E. Kumana, B.A., M.Sc. (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	....	Technological Assistant, Dharwar, up to 31st July 1929. Went abroad for further study.
,,	J. D. Ranadive, B.Ag. (Bombay).	Dharwar	Cotton Mycology ..	Pathological Assistant, Cotton Breeding Scheme, Jalgaon, Khandesh.	Indian Central Cotton Committee.
,,	P. K. Roy, M.Sc. (Dacca) ..	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	....	Resigned in July 1925.
,,	K. R. Sen, M.Sc. (Dacca) ..	Do. ..	Do. ..	Technological Assistant, Lyallpur.	Indian Central Cotton Committee. Obtained a Doctorate (D.Sc.) in 1934.
,,	L. N. Rao, M.Sc. (Calcutta) ..	Do. ..	Cotton Microscopy..	Lecturer in Botany, Central College, Bangalore.	Resigned in August 1926.
1926	D. F. Kapadia, B.A. (Bombay), M.Sc. (Tech.), (Manchester).	Do. ..	Cotton Technology .	Head of the Textile Manufactures Department, Victoria Jubilee Technical Institute, Bombay.	Late Senior Research Assistant, Assistant Technologist, Technological Research Laboratory, Matunga, Bombay.

RESEARCH STUDENTSHIPS—*contd.*

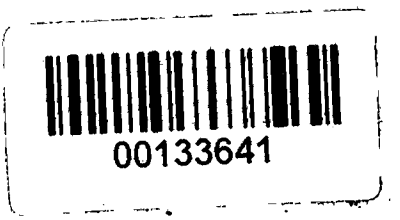
Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1926	Ram Saran Koshal, M.Sc. (Punjab).	Technological Research Laboratory, Matunga, Bombay.	Textile Physics ..	Senior Research Assistant (Physicist), Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.
,,	M. A. Shama Iyengar, B.Ag. (Bombay).	Surat	Cotton Physiology ..	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist, Sakrand.	Awarded a Training Grant for foreign study in 1933.
,,	Karam Singh Lamba, B.Sc. Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Resigned in July 1927.
,,	Y. D. Wad, M.A., M. Sc. (Bombay), A.I.I.Sc.	Coimbatore	Cotton Bio-chemistry.	Chemist and Agronomist, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
,,	H. A. Idnani, B.Ag. (Bombay).	Institute of Plant Industry, Indore.	Cotton Botany ..	Sind Agricultural Department, Cotton Supervisor, Indus Right Bank, Sind Seed Distribution Scheme, Dadu.	Do.
,,	S. C. Talesara, B.Ag. (Bombay).	Do. ..	Do. ..	Assistant Farm Superintendent, Institute of Plant Industry, Indore.	Do.
1927	R. Lakshminarasimha Iyengar, M.Sc.	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Technological Assistant, Coimbatore.	Do.
,,	Anant Krishna Thakur, M.Sc. (Bombay).	Institute of Plant Industry, Indore.	Cotton Bio-chemistry.	Assistant Chemist, Indian Lac Research Association.	....
,,	Dev Raj Mehta, B.Sc., Honours School (Punjab).	Lyallpur	Cotton Entomology.	....	Secured Government Scholarship for study abroad and obtained Ph. D. (Cantab).

Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
1927	Uma Shankar, M.Sc. (Allahabad).	Cawnpore	Cotton Entomology.	Assistant Professor of Zoology and Entomology, Agricultural College, Cawnpore.	Obtained Doctorate at Edinburgh.
,,	Shripad Shamrao Rane, M.Sc. (Benares Hindu University)	Institute of Plant Industry, Indore.	Cotton Physiology..	Unemployed.	....
,,	Sant Singh Verma, M.Sc. (Benares Hindu University).	Dharwar	Cotton Physiology in connection with Cotton Wilt Investigation.	....	Awarded a Foreign Scholarship by the Indian Central Cotton Committee. Obtained Ph. D. (Lond.)
,,	Lakshmi Narayan Mathur, M.Sc., (Punjab).	Institute of Plant Industry, Indore.	Cotton Breeding ..	Crop Botanist, Ujjain, Gwalior Department of Agriculture.	....
,,	Kadaba Rangaswamy, M.Sc. (Calcutta).	Coimbatore.. ..	Do. ..	Unemployed.	....
,,	S. Shamser Singh, M.Sc. (Punjab).	Institute of Plant Industry, Indore.	Cotton Agronomy ..	Agricultural Officer, Bikaner State.	....
1928	K. Dharmarajulu, M.Sc. (Bombay).	Dharwar	Cotton Mycology ..	Assistant Botanist, Madras Pempheres and Physiological Scheme.	Indian Central Cotton Committee.
,,	Piare Mohan, B.Sc., Honours School (Punjab), M.Sc.	Cawnpore	Cotton Entomology.	Field Assistant, Parasite Work, Pink and Spotted Boll-worm Scheme, Punjab.	Do.
,,	R. N. Gidwani, B.Ag. (Bombay).	Surat	Cotton Agronomy ..	Sind Agricultural Department, Inspector of Agriculture, Eastern Nara Circle, Mirpurkhas.	....
,,	M. Kanti Raj, M.A., B.Sc. (Agri.) (University of Edin.)	Institute of Plant Industry, Indore.	Do.	Madras Agricultural Service.	....
,,	C. Nanjundayya, M.Sc. (Calcutta).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology.	Junior Research Assistant, Technological Research Laboratory, Matunga, Bombay.	Indian Central Cotton Committee.

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
	1929	Sringabhushana, B.Sc. ..	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Technological Assistant, Surat.	Indian Central Cotton Committee.
3	,,	Bhai Pratap Singh Bhullar, B.Sc. (Agri.) (Punjab).	Lyallpur	Cotton Marketing and Economics.	Punjab Agricultural Department.	....
	,,	Bhai Ajaib Singh Gulzar, B.Sc. (Agri.) (Punjab).	Do.	Do. ..	Do. ..	....
	1930	Madan Lal Bhatia, M.Sc. (Punjab).	Do.	Entomology ..	Abroad for further study ..	....
	,,	Bhola Nath, M.Sc. (Punjab) ..	Institute of Plant Industry, Indore.	Cytology and Plant Breeding.	Genetical Assistant, Institute of Plant Industry, Indore.	Indian Central Cotton Committee.
4	,,	Pran Nath Mehra, M.Sc. (Punjab).	Sakrand	Do. ..	....	Resigned.
	,,	Brajendra Nath Bhargava, M.A. (Lucknow).	Lucknow	Cotton Marketing and Economics.	....	....
	1931	B. S. Sheshgiri, B.Ag. (Bombay).	Surat, Gujerat ..	Do. ..	....	Resigned.
4	,,	K. R. Dube, B.Ag. (Nagpur).	Nagpur	Do. ..	District Supervisor, Enquiry into the cost of production of Cotton and Sugar-cane crops, Central Provinces.	....
	,,	Santokh Singh Jaggi, B.Sc. (Agri.) (Punjab).	Lyallpur	Do. ..	Agricultural Assistant, Punjab Botanical Research Scheme.	Indian Central Cotton Committee.
	,,	Doraiswami Ayyar, B.A. B.Sc. (Agri.) (Madras).	Madras.	Do.	Madras Agricultural Service.	....
1	1935	Krishna Behari Lal, M.Sc. (Cal.), Ph. D. (Edinburgh).	Lyallpur	Cotton Entomology.	Second Assistant Entomologist at the Imperial Agricultural Research Institute, New Delhi.	....
2	1936	M. U. Parmar, M.Sc., (Bombay).	Technological Research Laboratory, Matunga, Bombay.	Cotton Technology .	Research Student. ..	Under training.
	,,	G. Rama Rau, B.Sc. (Bombay)	Do.	Do.	Do.	Do.

	Year of appointment.	Name.	Where posted on appointment.	Branch of Cotton Research in which scholarship granted.	How now employed.	Remarks.
			Foreign Research Studentships.			
1	1931	Sant Singh Verma, M.Sc. (Benares Hindu University).	Imperial College of Science and Technology, London.	Plant Physiology ..	....	Completed training, July 1935. Obtained Ph.D. of London University.
			Training Grants.			
2	1933	S. N. Venkataramanan, B.A., B.Sc. (Agri.) (Madras).	Calcutta	Cotton Statistics ..	Madras Agricultural Service	....
2	,,	C. Jagannatha Rao, B.A. (Madras).	....	Cotton Physiology ..	Research Student ..	Under training.
1	1936	P. Abraham, B.A. (Madras) ..	....	Cotton Cytology ..	Not yet joined ..	....
			Foreign Training Grants.			
2	1933	M. Taskhir Ahmad, B.Sc. (Agri). (Punjab).	Trinity College, Cambridge.	Entomology ..	Assistant Entomologist, Imperial Institute of Agricultural Research, Pusa.	....
2	,,	G. B. Patel, B. Ag. (Bombay).	University of California, U.S.A.	Cotton Breeding ..	Research Student ..	Completed training, July 1936. Obtained M.Sc. of California University.
2	1934	M. A. Shama Iyengar, B.Ag. (Bombay).	Tour in Hungary, England and Egypt.	Study of Kalar (alkali) lands and cultivation of superior Egyptian cottons with special reference to soil and environmental conditions.	Sind Agricultural Department, Senior Assistant to Agricultural Chemist and Soil Physicist.	....
2	,,	Nazir Ahmad, M.Sc. (Punjab).	Imperial College of Science and Technology, London.	Entomology ..	....	Obtained Diploma of Imperial College of Science & Technology, London.
1	1936	Kidar Nath Trehan, M.Sc. (Punjab.)	Rothamsted Expt. Station.	Applied Entomology	Research Student. ..	Under training.

"Indian Central Cotton Committee" in the remarks column indicates a post paid for from one of the Committee's Research Grants.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